Skyways

Flight Operations
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Engineering
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Management

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"IMPOSSIBLE" ICECAP RESCUE

ON THE SEVENTH day, the plane overhead radioed, "We'll try to take your injured men off tomorrow."

But to the twelve men huddling against a temperature of 20° below inside their wrecked Royal Air Force transport plane, there was little hope. They had crashed where the Greenland icecap was 8000 feet above sea level. No skiplane, they thought, could take off from that altitude.

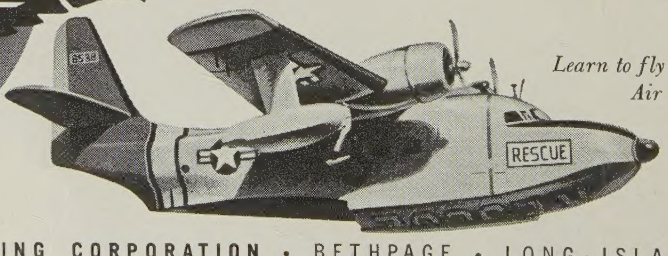
The next day, the wind plagued them with a mirage of engine sounds. Finally a hum grew, and an angel speck became a twin-engine—

"An amphibian? To land here?"

She did, then even taxied over the snow to the wreckage to load the stretcher cases. An hour of agony followed. Finally the JATO bottles were mounted to her hull, and she made the "impossible" take-off. Within two days, all were rescued.

Grumman salutes the USAF Air Rescue Services crew of that Grumman SA-16. Especially proud are the engineers who wedded a retractable ski to the amphibian keel, who created the Grumman Albatross *Triphibian* and made it possible to help save men on snow and ice, as well as sea and land.

Grumman



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Skyways

Flight Operations • Engineering • Management

COVER: Vickers Viscount in production

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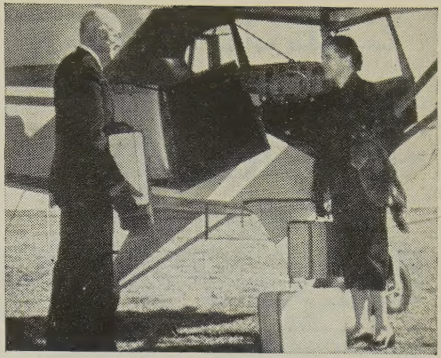

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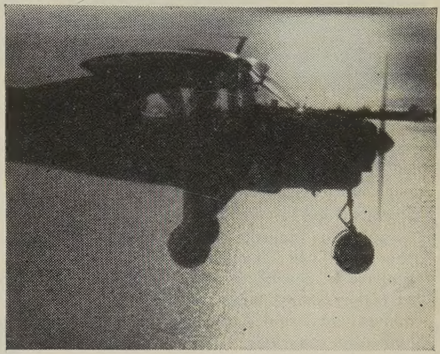

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Radar Traffic Control

Gentlemen:

Re. your Round Table discussion in the April issue, on page 40 Capt. John F. Gill, Chief Pilot, Eastern Air Lines, says, ". . . and another problem that must be solved or improved to a great extent is this one of identification. No one seems to have the answer to it right now. There must be a radar beacon of some kind."

Capt. Gill is on the right track. Yes, there is an answer, and it's strange the aviation world doesn't have it. After reading your R-T discussion, I decided to drop everything and pound this off to you.

Capt. Gill will find his answer in the field of marine radar. The New York Port Authority will give him full details, but here is a concise explanation of how it works in marine radar: Take New York harbor in a thick fog where there is the usual high traffic density. The radar traffic control, controlling the movements of the vessels in the harbor, wants to identify a certain ship. Radar traffic control will request the ship, "KXWX", for example, to make a signal for radar traffic control. KXWX then actuates a circuit which causes the blip of KXWX on the PPI to momentarily show a tail. KXWX, therefore, becomes readily identified by this tail. What makes this possible is a very small portable apparatus, entirely feasible aboard aircraft, which the pilot takes with him when he goes aboard to pilot the ship to the dock.

JAMES H. T. MURPHY
Comm. Lic. #71028
Chief Mate, Merchant
Marine Lic. #149225
Wilmington, Calif.

We contacted Mr. Wm. T. Carnes, Jr., Manager, Electronics Engineering, ARINC, regarding your comments, Mr. Murphy, and here is his reply: "I understand that the marine people are almost as confused as are the aviation people in regard to standardizing on a particular radar beacon system for universal use. Racons and Ramarks are names applied to specific types of radar beacons which have been widely used for marine service. I understand that the system employed in the New York harbor is a Sperry system which is a simplified version of several other types of basic radar beacons. This particular system shows an elongated pip when the ship pilot energizes a particular control after receiving a request for identification from the radar traffic control operator. Other types of marine radar beacons operate in a manner similar to the various types which have been employed by aviation; some provide a reinforced pip; some provide a coded return from a particular ship; others provide only an azimuthal bearing line indicating only the direction of the particular ship, rather than the location of the ship.

"I believe Mr. Murphy misinterpret Capt. Gill's comments and received the i pression that the aviation industry is doi nothing about providing means of identific tion of aircraft, and I believe he also fe that the aviation industry is not aware of t technique of radar beacons. It is conceivab that this misinterpretation could arise b cause we often comment that our prime ne is for a system of aircraft identification solve air traffic control. However, we negle to state that we know the answer lies in radar beacon because we assume that eve one in the business knows that the long a confused wrangle in the aviation field on t controversial subject of radar beacons.

"The radar beacon wrangle now appe to be over. A recent report prepared by t RTCA Ad Hoc Committee on Radar Safe Beacons has been completed and will be r leased in the near future. It appears that t military, the CAA, the airlines and the man facturers are now in complete agreement th a separately interrogated type of radar be con system should be standardized up With this universal agreement, standardi tion of system specifications on an intern tional basis should take place at an ea date, with equipment procurement and i plementation following shortly thereafter."

We'll be bringing you more on this su ject soon, Mr. Murphy.—Ed.

Nav-Aids Changes

Gentlemen:

In the April issue, under Nav-Aids Chang you listed Wheeling, W. Va., TVOR iden fication as HIG, but it is HLG. Also t magnetic bearing from the VOR to Wheeli Airport is 220°.

Wheeling Airport is Ohio County, n Wood Country Airport. Wood County A port is about nine miles northeast of Pa ersburg, W. Va.

A. E. FRANCE
Pilot
W. Va. Conservation Commission
Charleston, W. Va.

Thank you for calling our attention errors in the Nav-Aids Changes. We have c rected our records and from now on will n only check but double-check such inform tion.—Ed.

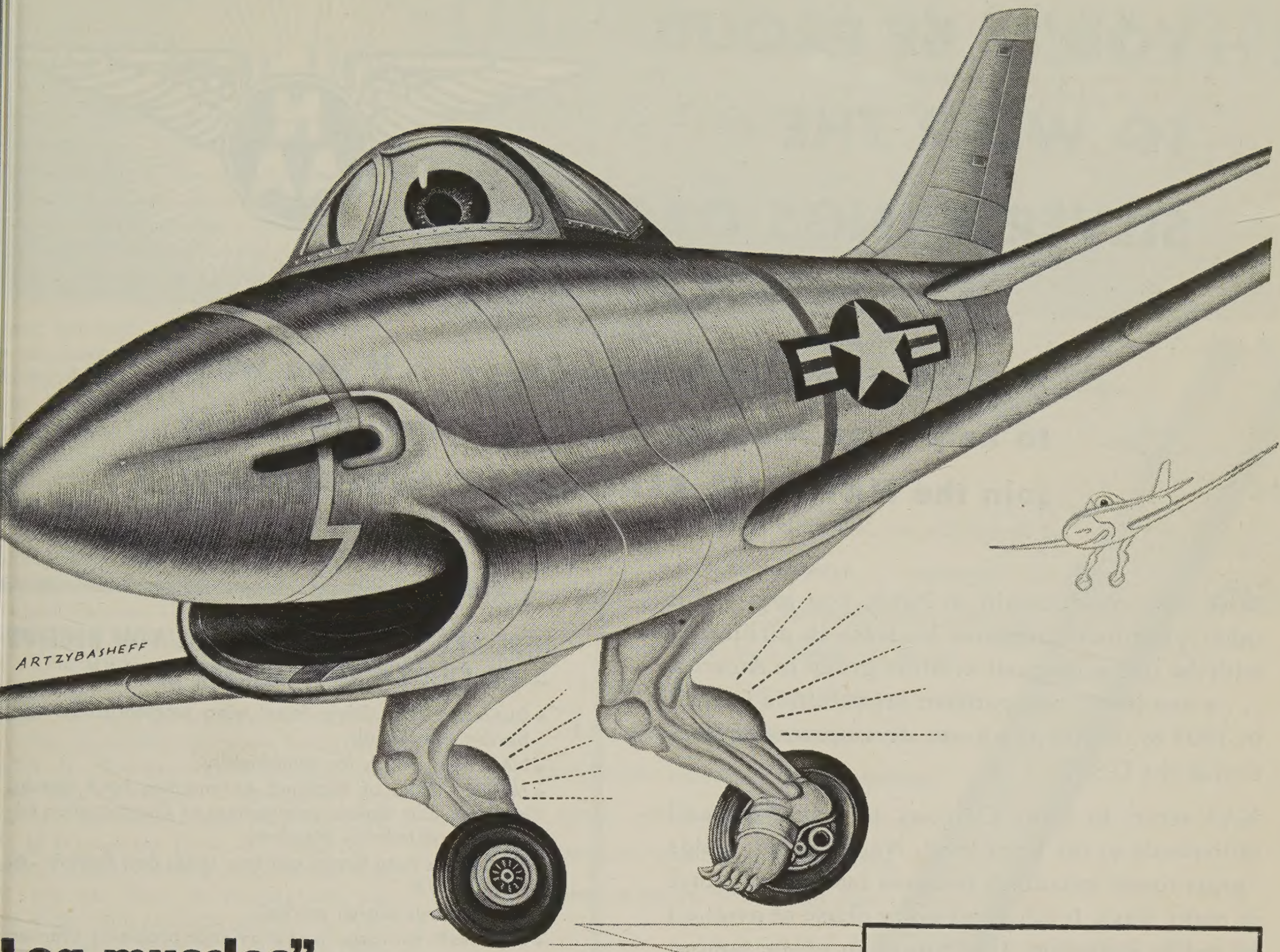
Airport Info

Gentlemen:

Could you tell me how many aircraft go and out of N. Y. International Airport year?

R. T. BENSON
New York, N. Y.

According to latest figures, there we 105.205 aircraft movements in 1952. This cludes scheduled, non-scheduled, domest overseas flights in and out.—Ed.



Leg muscles"
that cushion a jet's landing

When the landing gear of an F-86 Sabrejet hits the runway at lightning speed, the shock is absorbed by hydraulic action within the tough, precision-made cylinder on each "leg." To machine these 37-lb. cylinders to exact tolerances from solid 158-lb. steel forgings . . . to give them mirror-smooth inside finishes . . . Cleveland Pneumatic depends on Lycoming.

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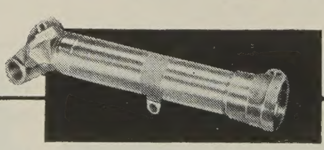
For main leg cylinders that enable a Sabrejet to absorb the jolt of high-speed landings—Cleveland Pneumatic looks to Lycoming's precision production



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aul Feeger of Minneapolis-Honeywell's
er office is now assigned to M-H's Al-
ierque industrial sales engineering staff.
dward H. Farmer has been elected Vice
ident—Manufacturing, Pacific Airmotive
. by PAC's Board of Directors. **Verle J.
ger** has been upped to Industrial Rela-
Manager at PAC-Chino.

ichard C. Smyth, Director of Em-
ee Relations for Arma Corporation, is
a vice president of the company. He will
inue to be responsible for all Arma labor
ions.

. B. Crean has been named Administra-
Assistant to the President of Ingersoll
lucts Div., Borg-Warner Corp.

. W. Hurtt has been appointed Assist-
Chief Engineer—Design of TEMCO.

Villiam D. Smith has been named Man-
of the Military Service Bureau of Capi-
Airlines.

ack M. Bowman, formerly with the
, has joined the Operations Department
TA. Mr. Bowman will be primarily con-
ed with various ATA operational pro-
ns and liaison work with the CAA, CAB,
, ICAO and the Dept. of Commerce.

Irs. Lillian Freytag succeeds her hus-
l, the late Peter D. Freytag who was
d while flight testing a *Spitfire,* as Presi-
of American Aircraft Corporation. **Mor-
Jaffie** is Vice President.

homas P. Hennessy has been upped
hief pilot of Northwest Airlines' Eastern
on. **O. A. Byrne,** former flight service
ctor of North Central Airlines, has joined
A as special sales counselor.

obert L. Goodyear is now chief engi-
of Marquardt Aircraft Company's new
ineering Division, Van Nuys, Calif.

npanies

Ierger of Luscombe Airplane Corp. with
into **TEMCO Aircraft Corp.** has been
pleted, and Luscombe will henceforth
nown as the **Garland** plant of TEMCO.

eneral Controls Co., of Glendale, Cal.,
opened a new field sales and service office
yracuse, N.Y. **Leonard Schnall** has been
ed to head the Syracuse branch. A new
rtment has been set up at Glendale to
y customer requirements in the design
development of new products; it is head-
y **H. A. McIntosh.**

he Swedlow Plastics Company has ac-
ed the facilities, personnel, methods, tech-
ies and engineering services of the Sierra
lucts Co., Los Angeles, Calif.

Iarquardt Aircraft Co., Van Nuys,
f., has appointed **Heintz and Company,**
, of Los Angeles, to direct its advertising
sales promotion programs.

alifornia Central Airlines has con-
ted to handle radio line maintenance on
rican Airlines DC-6 Airtourist flights.

VICKERS VISCOUNT

Facts on the development and operation of first turboprop airliner to go into scheduled service

by Christopher Clarkson

The fact that British European Airways started operations with their Vickers *Viscount* 701's on April 19th, 1953, has focused attention onto this, the first of the turboprop airliners. Also the fact that both Trans-Canada Airlines and British West Indies Airways will be using these aircraft in the Western Hemisphere in 1954 or 1955, brings home the fact that this type will soon be seen at several of the International Airports in the United States. By 1954, of course, the experience of such operators as BEA and Air France will have proved or disproved once and for all some of the rumors that there are difficulties in the operation of propeller-turbine aircraft, either with regard to their engines or with regard to actual operations and traffic control.

It is not always appreciated that, with most commendable foresight, BEA decided to get advance information on some of these problems very early in the game by converting two C-47 *Dakotas* to Rolls-Royce *Dart*-engined aircraft. The first machine so fitted was received by them as long ago as June, 1951. Since then these warriors have operated a regular cargo service between London and the Continent and have, among other things, caused an occasional stir when they have been seen stooging quietly along at 25,000 to 28,000 feet. In fact, during one of the numerous air exercises over Europe, a *Meteor* pilot, who was ordered to intercept what was believed to be an "enemy" bomber, had quite a time convincing his operations room that it was, in fact, a C-47 with BEA markings. Actually, these aircraft had a cruising speed of 202 mph at 25,000 at 700 shp, with a fuel consumption of about 120 Imperial gallons (approx. 145 U. S. gallons) per hour. Because no increase in tankage was made, the range was somewhat limited, but for European freight work with a development project of this nature this was of no great importance.

Not content with this experience alone, however, both BEA and Vickers-Armstrongs combined their forces to enable the *Viscount* 630 prototype to be used on actual passenger operations, during which some 1,815 passengers were carried, and later on they again combined their crews and experience in the proving flights of the prototype 700 throughout Europe.

Up to the end of February, 1953, BEA had had nearly 3,000 hours of turboprop experience. As a result of this cooperation, the *Viscount* 701 production models reflect the operators' most advanced thinking and it may be said to be an aircraft which fully meets the airlines' needs. This past winter, the *Viscount* 700 (the prototype production aircraft) was on loan to Trans-Canada Airlines who subjected it to the severest cold weather and icing conditions they could find. As a result of these trials Vickers will be able to supply TCA with an aircraft which will meet the most stringent Canadian conditions. Incidentally, this same aircraft made the Atlantic crossing from Prestwick to Montreal, thus being the first commercial turbine aircraft, military or civil, to cross the Atlantic. At the time—and so soon are pioneers forgotten—only a few people remembered that it was another British aircraft, also built by Vickers and powered by Rolls Royce engines, the Vickers *Vimy*, that made the first non-stop crossing of that ocean from West to East on June 15th, 1919.

It is, of course, too early to be able to say much about the actual operational problems of turboprop aircraft, but the writer has always felt that these will, in practice, prove easier of solution than is normally believed. Obviously, the greatest attention must be paid to flight planning. Delays and taxiing on the ground must be kept to a minimum when engines are running. The climb to altitude must begin just as soon as possible, and the best altitudes for fuel consumption maintained as long as possible. Accurate weather forecast- *(Continued on page 50)*

VICKERS VISCOUNT, *700 series (above), began operations under the British Overseas Airways' banner in April. With an all-up weight of 58.500 lbs., it can carry a payload of 13.600 lbs. for 830 miles, plus a reserve*

TURBOPROP *engines that power the Viscount are four Rolls-Royce Darts, each developing 1400 shp at 14.500 rpm plus 365 lbs. thrust. By 1954, Vickers expects to be producing eight 66/80-passenger Viscounts a month*

Landing Speed Indicator

New instrument gives pilot precise, reliable, continuous information about lift of wings in take-off, approach-speed ranges

by Herb Fisher
Chief, Aviation Development
Port of N.Y. Authority

This is the story of the first instrument ever developed to give the pilot precise, reliable, continuous information about the lift of his wing in the critical take-off and approach-speed ranges.

It's called the Landing Speed Indicator and here's what it does:

Eliminates the need for constant reference to airspeed, except as a cross-check, during approach, landing, take-off, and single-engine climb-out.

Displays the airplane's best lift altitude, on take-off or approach, by compensating automatically for such variables as gross weight, landing gear, acceleration, flap and power settings, and gust loads.

Makes consistently accurate and uniform landings possible by maintaining a lift control condition which reduces to a minimum chances of undershooting or overshooting.

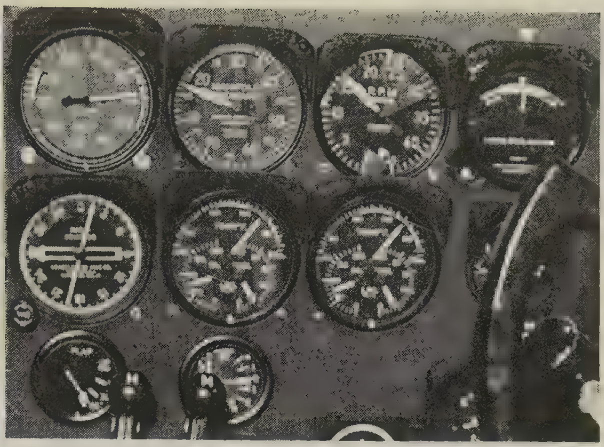
The Landing Speed Indicator, a product of Safe Flight Instrument Corporation, accomplishes its jobs by displaying the upper portion of the lift curve as a three-colored, 75° arc on a standard needle-type dial. The needle or pointer receives its information from a sensing vane placed at the stagnation point just below the leading edge of the wing. Most of us know that at that point the air flow is split to pass above or below the wing's surfaces. The action of the air at the stagnation point has a definite relationship to the lift coefficient of the wing. By installing a transducer with the sensing vane, Safe Flight's engineers relay back to the Landing Speed Indicator on the flight panel accurate measurements of the wing's lift coefficient.

"This instrument puts the seat of the pilot's pants right up there on the panel," someone remarked during our evaluation of the LSI in flights with the Safe Flight Twin-Beech.

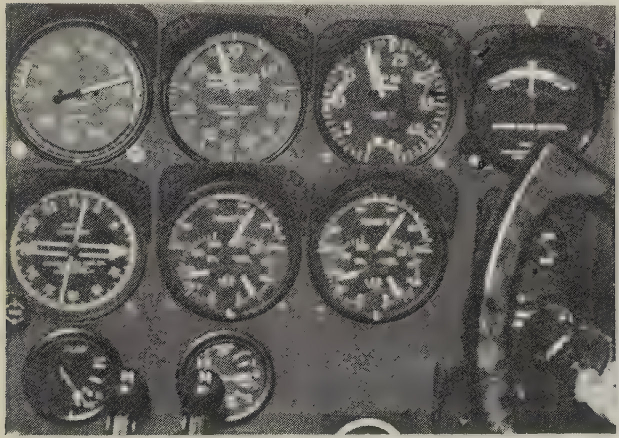
Maybe so. But no pilot, relying on his deep muscle sense or feel, could *(Continued on page 48)*

AIRSPEED *indicator in this photo is caught with its lag showing. The photo was taken during a simulated approach in a Twin-Beech. Although pointer of the Landing Speed Indicator has edged into the red, meaning plane is dangerously close to a stall, the airspeed indicator shows 100 mph, well above the D18's stall. The readings on the LSI are instantaneous, pointer does not oscillate*

1.—*This was taken during single-engine climb-out. With power on right engine (2275 rpm, 33 ins. manifold), left engine idling at 1,000 rpm, airspeed shows 108 mph. The LSI, with pointer on line between fast and good lift, tells pilot he is in the best attitude for smooth climb-out*



2.—*In this photo the Twin-Beech is in an approach at its designed glide speed and a low power setting. The airspeed indicator reports 97 mph; the flaps are down. The Landing Speed Indicator pointer is centered and thus clearly tells the pilot that he is maintaining the best lift condition*



3.—*How the LSI compensates for power is shown here. The LSI is centered, indicating best lift condition, although airspeed shows 90 mph; flaps down. Note 7-mph difference between airspeed here and Number 2 showing the low power*

4.—*This photo shows how LSI compensates for flap effect. Approach is normal, with airspeed at 103 mph, no flaps. Comparing this with Number 2 shows how LSI completely ignores the airspeed. In each case LSI pointer is centered*

5.—*When this photo was made, Herb Fisher was flying ILS approach with the LSI. With airspeed slightly under 100 mph, the airplane had just passed the Outer Marker. Note the LSI pointer shows airplane is in good lift position*

6.—*This panel photo was taken at touch-down when flying the LSI (centered on best lift segment of the arc). Note the rpm, manifold, airspeed and flap setting. At this point Pilot-Author Herb Fisher was about ready to cut power*

by J. J. George
Supt. of Meteorology, Eastern Air Lines

in the face of THUNDERSTORMS

Attention to weather maps and charts, and application of Whiting's criteria helps assure passengers good air trip

One fine day in June 1944, a pilot and I were alone in a C-47 returning from Ceylon to Calcutta. The Monsoon had not yet reached the area and it was a beautiful day for flying along the coast of the Bay of Bengal. A little more than half way to our destination we could see ahead of us what appeared to be an unusually large thunderstorm. As we reached Vizagapatam, we also reached the thunderstorm. It was undoubtedly the most awe-inspiring cloud I have ever seen. The walls were vertical and had the clean, almost polished appearance of a marble column. Perhaps we imagined it, but we thought we could see the cloud-mass boiling beneath its skin. At our flight level of about 8,000 feet there was a short skirt that apparently surrounded the entire storm; it projected outward and downward from the storm for a few hundred feet.

It took us no longer than a short conference to agree that neither of us wanted anything to do with this particular cloud. We changed our course and actually flew beneath the skirt of overhanging clouds, with our left wing tip a few feet from the main cloud, for a long way to sea. That storm must have been 50 or 75 miles in diameter. Whether it was the granddaddy of all thunderstorms or whether it was the biggest bluffer of all storms, I shall never know—and I am content not to know.

If they fly long enough, most pilots will encounter situations analogous to this one. Up to about six or seven years ago meteorologists, along with pilots, could only speculate as to answers to such things as this. In 1946, however, a plan, originally suggested by Dr. C. E. Buell of American Airlines and sponsored by the Air Transport Association, was implemented by Congress and a coordinated program of probing thunderstorms by means of instrumented aircraft flying through the same thunderstorm simultaneously at levels from 5,000 to 25,000 feet

was inaugurated. This project has resulted in an understanding of the structure of thunderstorms which we had never before possessed. (The results are published by the Department of Commerce, Weather Bureau, in a book called *"The Thunderstorm,"* for sale by the Superintendent of Documents at $2.25 each.) Today, we have only begun to exploit that knowledge.

According to the concept developed, the thunderstorm begins with upward currents throughout the incipient thunderstorm cloud. At this stage the ascending air within the cloud is everywhere warmer than its surroundings. The next stage is considered to be the mature stage. Snow formed in the upper reaches of the cloud has increased to such an extent that in one section of the cloud it has begun to fall. As the snow passes the freezing level, the snowflakes melt and continue to fall to the ground as rain. This falling shaft of precipitation apparently initiates the down-current within the thunderstorm so that in the mature stage, which to the pilot is characterized by rain reaching the surface, up-currents and down-currents are adjacent within the cell. In this stage, also, the temperature within the cloud and the down-current is colder than the surroundings, while it is still warmer in the region of the up-current. In the initial and mature stages of the storm, the greatest turbulence is encountered by aircraft traversing it.

The final stage is characterized by down-currents throughout the cell and decreasing rain at the surface. As a rule, in this stage, turbulence is actually much less, although the cell itself may appear more vicious than at any other time.

A thunderstorm is not often composed of a single cell, which complicates things for the pilot. It will usually have several cells, some in the mature stage, some beginning, and some in the dying stage.

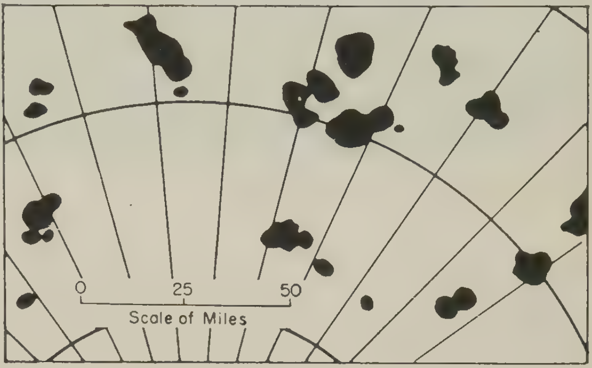
This brings up the matter of how thunderstorm cells look to the radar. From the book, *"The Thunderstorm"* are shown two schematic diagrams *(right)*. In one, the scattered black echoes represent the random scatter of air-mass thunderstorms. In the other diagram, a cold front or squall line has been illustrated showing the cellular structure involved. These diagrams are representative of PPI scopes, showing the horizontal positions of the echoes.

Of course, with airborne radar you have these presentations in the cockpit and it becomes a comparatively simple matter for the pilot to avoid these active cells and, consequently, the greatest amount of turbulence. Most pilots, of course, do not have the advantage of a radarscope in the cockpit, but at a number of places throughout the United States ground radar sets are in use by the Weather Bureau, and reports of thunderstorm echoes are distributed both by landline and to some extent by radio.

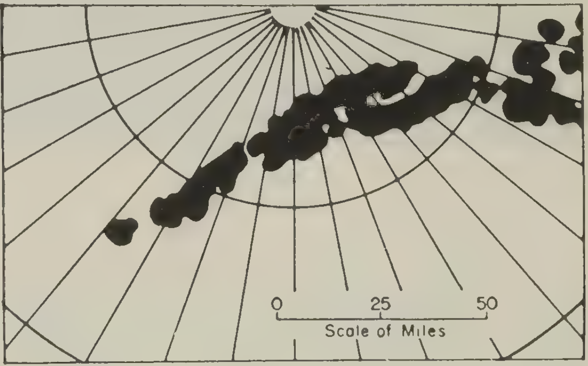
The problem of choosing the best altitude to fly through thunderstorms is one that has had a long and controversial history. We can say now, however, that if a thunderstorm must be flown through, the first choice for aircraft with service ceilings less than 25,000 feet is as low an altitude as possible that will also provide adequate terrain clearance.

For high-flying aircraft, particularly jets, that can reach 30,000 to 40,000 feet, these levels are preferable because it is frequently possible to circumnavigate the buildups at these levels.

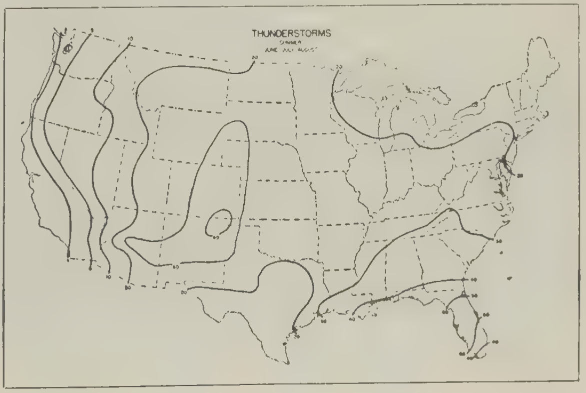
(Continued on page 53)



SCHEMATIC PRESENTATION *(above) is of actual radar echoes on a day of random air-mass thunderstorms. Black areas (storm echoes) are regions of net upward motion; white area is region of net downward motion. Radial lines and arcs indicate azimuths, ranges from radar site. The schematic presentation (below) is of radar echoes on day of squall-line thunderstorms. Black, white areas and radials, arcs indicate same as for air-mass storm*



WEATHER BUREAU *map indicates mean number of days with thunderstorms, based on summaries for 266 stations, 1951*



GAYLORD CONTAINER CORPORATION *of St. Louis, Mo., operates its fleet of business aircraft on "milk runs" between its executive offices in St. Louis and its mills in the forests of Bogalusa, La., 70 miles from nearest airline stop*

SEARS, ROEBUCK & CO. *operates its fleet of two DC-3's and two Beech D18's an average of 2400 hours yearly. These aircraft keep executives in personal contact with Sears' more than 1,000 factories, offices in U. S., Mexico, Canada, etc.*

RYNEL CORPORATION *of Sterling, Ill., flies its executives in its three airplanes to points difficult to reach by airline or train. After acquiring its aircraft, Rynel's business backlog multiplied from $30,000 to $3,000,000*

The business plane proves itself an effective tool in expanding commercial markets, introducing new sales methods

American Business on the Wing

by Jean H. DuBuque
Executive Director, CAOA

"The Best Prophet of the Future is the Past"
Lord Byron—1821

In the years following World War II. the airplane emerged as a swift and practical instrument for business transportation. It was an inevitable development, resulting from the collective experiences of busy executives who were compelled to do much traveling regarding war contracts and related defense matters.

Any businessman who had to make frequent distant trips during the recent war—and they numbered many thousands—looks back with considerable apprehension to a possible repetition of that trying experience. Although the railroads did an outstanding job in moving enormous quantities of war material. the passenger services under the stress and strain of wartime conditions. left much to be desired. Difficulties in making reservations, trains hours behind schedule, over-crowded and uncomfortable accommodations. caused many over-worked executives to fret and complain about the waste of their valuable time.

The scheduled domestic airlines also were badly handicapped since many of their transport aircraft were taken over early in the war by the military for emergency airlift to the embattled Pacific areas. Although forced to operate under a system of tight priorities. overwhelmed with demands for seats, bogged down with unraveling government red tape, they yet were able to accomplish miracles in air transportation for both civil and military travelers.

Even private automobile owners were limited in movement by gas and tire rationing, particularly in traveling long distances. They also were unable to replace worn-out cars with new ones. Since corporations and businesses pay top executives for their ability to offer intelligent market interpretations and make sound decisions. needless delays in traveling to destinations. plus high pressures and the lack of relaxation. cost many organizations heavily in money and in wear and tear on their officials under the exigencies of wartime.

Taking a well-learned lesson from these exasperating experiences of yesteryear. hundreds of businessmen today are flying into every nook and corner of the nation and beyond its borders in company-owned aircraft that provide exceptional flexibility and freedom of movement. Relaxing in comfortable cabins and flown by expert pilots at speeds up to 300 mph. with more than 6,000 airports throughout the country available for use by single-engine and most multi-engine types, executives are finding that the business airplane is more than justifying itself from an economic standpoint. It also is contributing to greater business efficiency by providing its user with many advantages over less fortunate competitors.

Extravagant air transportation! Indeed not, especially when such travel costs annually average about 30 cents per aircraft mile. The records of many commercial and industrial concerns will substantiate this yearly low cost of up-to-the-minute business air transportation. proving that it is not a managerial luxury but a competitive necessity. Instead of the top management and stockholders of hundreds of organizations questioning the value of their business-aircraft ownership, they are asking, "Could we afford to be without an airplane?"

However. since the business airplane is such a newcomer in the civil air-transportation field. thousands of business concerns have yet to appreciate its utility and versatility. But those business leaders who have found that an airplane is as essential to their operations as office equipment have every intention of expanding its usefulness as a "tool" for day-to-day travel of their officials and field personnel.

The dramatic role which the business airplane now is playing and is destined to play on the American commercial scene perhaps could be better understood by briefly reviewing certain phases of the past development of surface transportation.

During the last half of the 19th century, when the railroads began to criss-cross the land and link remote communities *(Continued on page 56)*

by George Kent

THE BILLION-DOLLAR RACE

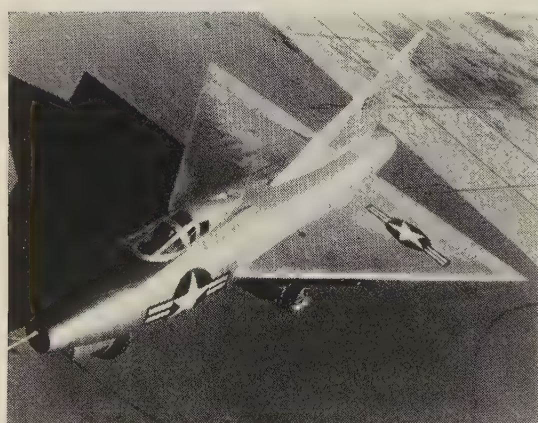
U. K. has jetliner in operation, propjets in production,

but expects keen competition from U. S.-projected designs

Up to a year or two ago the Americans who build big passenger planes hadn't a care in the world. They were making 90% of all the airliners flying; and there was no competition. No matter what country you were in, if you flew, you flew in an American plane. And then Britain lighted the bomb.

Out of a country economically lame and low in morale came the *Comet*, the world's first jet-propelled passenger plane. It flew eight miles a minute, which is almost twice as fast as any other civil transport. And it wasn't a show plane, it was in business. Week after week it carried passengers from London to Johannesburg, from London to Singapore and Colombo—more than 100,000 miles a week.

Soon the British made a second, larger, better *Comet*—and announced a third and a fourth, the last capable of stepping from London to New York in seven hours. At the same time four other British plane makers let it be known that each of them had in the works long-range jetliners of singular promise, all able to fly the ocean with big payloads at speeds



DELTA WING XF-92A *(above) is jet research design that led to the development by Convair of the F-102, the Air Force's highly secret all-weather fighter*

DOUGLAS DC-7 *(above right) is being built according to specifications of American Airlines; will be powered by compound engines; have 360-mph cruise*

LOCKHEED *Super Constellation (right) employs compound engines, is larger than Connie. It and DC-7 are expected to be last of piston-engine transports*

just a little short of sonic. Britain was on the way.

Our builders have now hung up their coats and they're working nights and Sundays. They're also spending money. In the next few years they will dig out of their reserves about $150,000,000 to finance the new jet and turboprop models.

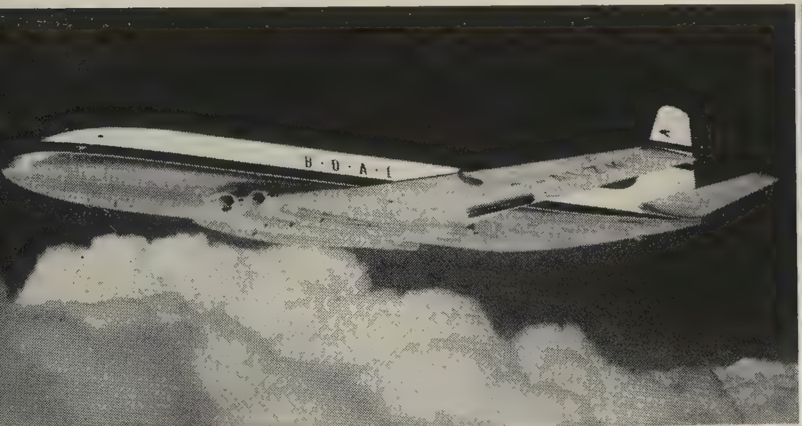
No one knows how much we lag behind the British. The figure generally accepted is three years. It is probably less. Most of the guessers forget that our manufacturers already have achieved regular production of a jet larger than the British *Comet,* the B-47, which flies 3,000 miles with a tremendous load of bombs, and that we have flown the prototype of the B-52, which has a greater range. We have also developed superb engines. The Pratt & Whitney J-57 is one of the most powerful in the world, and the same company has another, considerably better—the J-75—now on the testing beds.

But the need to adapt these engines and designs to domestic-airline use hasn't been pressing. Present flight time New York to Chicago is two hours 45 minutes; add taxi time and it makes four hours 15 minutes, hotel to hotel. Jets would cut the flying time about an hour, but the time hotel-to-hotel would still be three hours 15 minutes, and at a healthy increase in fare because of the heavy fuel consumption.

There are at this moment three and possibly four American jetliners on the drawing boards and in various stages of construction. Not much detail is available, but it is known they will carry from 85 to 125 passengers at an altitude of 40,000 to 50,000 feet at a speed of 500 to 600 mph. One fact is certain: they will be economical; they will permit the owners to operate at a profit; otherwise those hard-boiled citizens won't buy them regardless of their speed, comfort or passenger capacity. They will be in the air about 1958.

The British expect our new airliners to be powerful competition, and lights are blazing through the night in every engine and aircraft factory in England. They remember the American knack for getting things done in a hurry—how the first *Super-Constellation* went from idea to production in 12 months. And they know that a British victory in this race is their one best bet to get the dollars Britain so badly needs.

One of the most authoritative voices, also one of the loudest, is that of *(Continued on page 59)*



AVRO 698 *(above) is British delta wing bomber ordered off drawing board for the RAF. It is regarded as possible passenger plane of the future by BOAC*

DH COMET *(above left) was first of the jet transports to go into scheduled airline service. British expect U. S. jetliner designs to be keen competition*

VICKERS VISCOUNT, *propjet transport, is being built for British European Airways, Air France, etc. It is said to be best of short-range transport designs*

Problems in Terminal Area Aircraft Operation

Pilots, CAA officials call for controlled traffic, VHF-ADF, speed limitations, re-evaluation of VFR limits, better communications, etc., in terminal areas

CHAIRMAN *of Round Table on "Terminal Area Aircraft Operation" was Jerry Lederer, Director, Flight Safety Foundation*

SKYWAYS FLIGHT OPERATIONS ROUND TABLE

JULY, 1953

Wings Club, New York, N. Y.

Chairman Jerry Lederer *(Director, Flight Safety Foundation):* "The general title of today's discussion is 'Problems in Terminal Area Aircraft Operation,' with emphasis on problems of safety, efficiency and noise—and each of equal importance.

"The most critical regime of flight is in the vicinity of the airport, for records show that about one-fifth of all serious and major accidents occur either in landing or on take-off. Not all of these accidents are due to traffic density, but traffic density is on the increase, and the hazards created by that density pertain mainly to the collision danger.

"John Chamberlain, Director of the Bureau of Safety Regulation, CAB, and one of the participants at this Round Table, gave a talk at the University of Oklahoma a few months ago, and I'd like to quote from that talk. John said, 'During the past 10 years, there have been 15 collision accidents involving air-carrier aircraft, eight of which happened near the airport. Rather recently we have had two accidents, one fatal and one serious, involving small aircraft caught in the wake of larger aircraft. The statistics on near-misses in the vicinity of airports are much harder to establish because many of them

"PILOT'S COMPETENCE," *reported J. D. Smith (left, next to Herb Fisher) "is important factor in terminal problem"*

"SEPARATE REGULATIONS," *said J. Chamberlain (left, next to D. M. Little) "cannot be written for specific airports"*

are not reported. However, the best information available is based on an incident report compiled by the CAA Regional Offices for an 11 months period in 1949. The total number of reported near-misses for the seven domestic regions during that period was 292. It should be assumed, however, that the actual number was much greater because we know that many such incidents are not reported to the CAA. Of those 292 near-misses, 219 or 75% occurred in the terminal area, and about 66% of the terminal area near-misses occurred when the flight was being made without a clearance. That doesn't mean that there was any violation of regulation or procedure, because in most cases a clearance was not legally required. About 44% of those terminal area near-misses happened under IFR or questionable VFR conditions.'

"Airport and air traffic control problems are going to become increasingly severe unless a well-integrated and practical plan is implemented soon. In line with that, the problems we discuss here might be on the subject of equipment—what minimum equipment should be on the airplane or in the control tower; controls—what controls should be placed on the aircraft operator to secure an orderly and safe entry into the controlled area. Perhaps we should also discuss the economics involved and, finally, how all this ties in with a temporary solution to the noise problem. I use the word 'temporary' because the ultimate solution is one of an engineering nature which cannot be discussed at this meeting.

"According to an estimate made by the Cornell Aeronautical Laboratory, the number of civil aircraft traffic movements by 1965 will be twice what it is now, so we can see how important the problems are.

"Before we get into our discussion, I'd like to quote once more from John Chamberlain's talk: 'One of the principal difficulties that seem to arise

"**TRAFFIC** *should be separated," said Ed Marsh (right, next to Bill Woolf) "on voluntary basis outside control zones"*

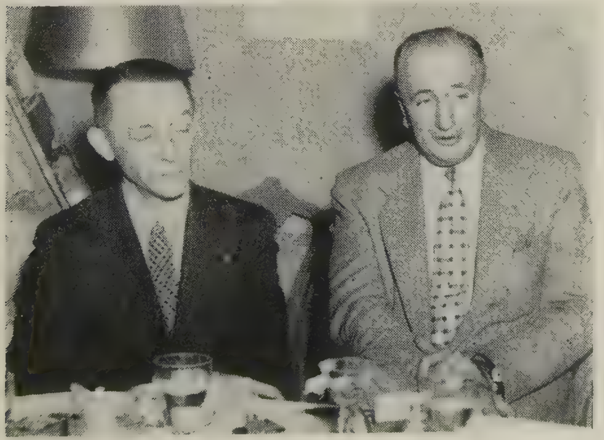
around airports is with respect to mixed traffic. If all traffic were under control, as it is in instrument weather, there would be fewer problems because all concerned would follow fixed procedures and traffic patterns. However, when we have a mixture of controlled and uncontrolled traffic, we seem to introduce certain problems which need attention, particularly in marginal weather.'

"Because, from the point of view of regulations, John Chamberlain is acting as a focal center for the problems, I'd like to ask him to start off our discussion by telling us what the thinking is in Washington at the present time."

Suggested Terminal Area Procedure

John M. Chamberlain *(Director, Bureau of Safety Regulations, CAB):* "In cooperation with the CAA, the airlines, private pilots and other interested groups, the CAB has been working on this terminal-area problem for the past year and a half in an attempt to determine what type of regulatory and procedural treatment is feasible. It's a very

"**SOLUTION** *to traffic control in terminal area," reported Arthur Jenks (right, with Dave Little) "lies in orbiting"*



"**SPEED** *limits given are on low side for B-377," reported Bill Moss (left) seated next to Port Authority's Fred Glass*

complicated problem because we have different types of aircraft and pilots of varying competency using the same general areas.

"One proposal which has been seriously considered calls for the establishments of a so-called 'cheese box' around a terminal area such as New York, Washington, etc.; this might be between 20 and 30 miles in radius and would extend up to an altitude of 3,000 feet and down to anywhere from 700 to 1500 ft., depending on the particular circumstances. All traffic within this 'cheese box' would operate under control—it wouldn't be considered IFR flight but it would have a traffic clearance, at least. The consideration of this proposal has revolved around whether such control is feasible under *all* weather conditions or only under restricted weather conditions. Some feel that all we can effectively get into at the moment is under conditions where visibility is 5 miles or less. The controlled zone, which is within this high-density area, would operate essentially as it does now, but perhaps *with visibility minimums raised somewhat.*

"Some of the problems which have kept us from actually coming out with any specific regulatory proposal during these past months, are illustrated by this New York situation, where in one area you have several busy airports and a multiplicity of frequencies involved. The CAA control people tell us it would be difficult, if not impossible, to maintain communications with or keep some kind of separation between all the aircraft that exist within a 20- or 30-miles radius of LaGuardia, for example, with the number of aircraft and the multiplicity of frequencies involved in this area. I, therefore, can't predict what the specific proposal may be. The problem is in the hands of a working group of the Air Coordinating Committee.

"It may well be that this working group of the ACC will come up with some kind of plan which will be put into effect on a trial basis at one of the airports in order to work out some of the problems. In connection with this type of trial implementation, a proposal has been made that the plan be put into effect on a voluntary basis first in order to explore all the aspects of it, particularly so that non-air-carrier or non-military pilots who do not have as much equipment or the flexibility of communications that the air-carrier pilots have, would not feel too reluctant to go along with the program to help everyone work it out. They wouldn't have to be afraid of a violation being filed, for example, if something did not work out according to the original plan.

"That's about where we stand at the moment. I'm sorry I can't predict with more certainty what may appear as the first feasible plan."

Jerry Lederer: "*In other words, what John thinks may be a temporary plan is a cyclinder with a 20-mile diameter and with its top at 3,000 ft. and its bottom somewhere between 700 and 1500 ft.; and under it another cylinder, having a 5-mile radius, which would be the normal present control zone. Anything entering the periphery of this cylinder would be under control when visibility is 5 miles or less. Is that right?*"

John Chamberlain: "That seems to be the latest thinking."

Jerry Lederer: "*So that we won't be spending time repeating what was discussed at a previous Round Table, moderated by Dave Little, I'd like to go over the 10 points that were made at that meeting, which was on radar traffic control in terminal areas.*

1. *The basic fundamentals of radar traffic control are entirely satisfactory and very desirable.*

2. *We're making a long-needed move in the right direction. However, we recognize that—*

3. *We are pushing bottlenecks further away, not completely eliminating each, and much remains to be done. We recognize—*

4. *The desirability of specific action toward more positive identification of aircraft in and under radar control;*

5. *More and better radar as regards seeing through heavy precipitation;*

6. *Possibly the need for and procurement and use of altitude-indicating radar when available;*

"MOST CRITICAL *regime of flight is near the airport," reported Mr. Lederer (right, next to Adm. Rosendahl, NATCC)*

"SPEED CONTROL," *according to John Groves (left), "would be unreasonably restrictive and is not the answer at all"*

7. The need for early commissioning of the planned ground VHF-ADF equipment, plus direct pilot-controller VHF communications;

8. Plus radar beacons on all aircraft operating into high-density terminals.

9. Improvements in available commercial or civil ground radar through lower frequencies and circular polarization.

10. A change in civil air regulations requiring all traffic in high-density areas to be controlled to eliminate the border-line weather hazards we have today.

"I mention these 10 points so that we won't repeat something that has already been decided upon.

"Dave Little, you were the moderator at the radar traffic control meeting, have you any comments on what John Chamberlain said about this problem of terminal approaches?"

Dave Little *(Assistant to Director of Flight, American Airlines):* "It's a pretty fundamental fact that with the aircraft speeds we have today the human eye working through the windshield or the glass windows of a control tower is not good enough. We must provide something better. We've got to use radar to establish the desired safety traffic separation and we must provide the direct and rapid air-ground communications so essential to ground and air personnel for passing the intelligence necessary to maintain the minimum of separation. Because we covered the radar aspects in a previous Round Table, I'd like to restrict my comments here to the communication problem. I believe most folks know that during the last 5 years much planning has been done toward automatic air-ground communication. As of today there's a great deal of question in many technicians' minds as to whether such automatic communication may be necessary; whether it can be justified or not.

"With the relatively recent advances made in electronics design, it is almost as inexpensive to obtain for aircraft the total of 180 communication channels now allocated to aviation, as it is to obtain a lesser number, say 10 or 20. Putting it another way, the cost of airborne communication equipment for the total allocated communication spectrum is now little more than it would be for a partial spectrum.

"Communications of many years have proved the fact that one man on the ground can seldom handle with any efficiency more than five aircraft in the air in a direct communication situation. It, therefore, boils down to dividing the potential traffic into units of five, establishing that number of communication channels and providing that number of people on the ground to supply the essential communication. From my own experience, I feel that if there are no more than five aircraft per direct ATC communication channel, the op- *(Continued on page 40)*

Round Table Participants

JOHN CHAMBERLAIN was named Director, Bureau of Safety Regulations, CAB, in 1947. He began his Government career with the Bureau of Air Commerce in 1936, and has held a pilot's certificate since 1932.

HERBERT O. FISHER, Chief, Aviation Development Div., Port of New York Authority, spent 14 years as an engineering test pilot for Curtiss-Wright before taking his present position; he began flying in 1928.

FRED M. GLASS was named Director of Aviation, Port of N.Y. Authority in 1949, and in that position is responsible for development and management of N.Y. Internat'l, LaGuardia, Newark, Teterboro airports.

JOHN GROVES, Manager of the New York Regional office of the Air Transport Association, has had an active Commercial pilot's certificate since 1929. At one time he was Manager of Washington Nat'l Airport.

ARTHUR E. JENKS, Chief, Flight Inspection Div., CAA, in Washington, began his flying career in 1927; qualified for his ATR in 1932. Mr. Jenks flight tested radar equipment for Army in 1942-1943.

D. M. LITTLE, Assistant Chief of Weather Bureau (Operations) in Washington, D.C., entered Weather Bureau service in Idaho in 1917. He established first Airway Weather Service (San Diego-Seattle) in 1927.

DAVID S. LITTLE, Assistant to Director of Flight, American Airlines, began flying in 1928; holds a current ATR 150-6600 hp single and multi-engine landplanes, and a valid FCC Radio Operators license.

EDWARD C. MARSH joined CAA's predecessor, Bureau of Air Commerce, as aeronautical engineer in 1937. He spent three years with Air Force at Wright Field; today is Chief, Aviation Safety Div., Region One.

WILLIAM W. MOSS joined Pan American in 1939; checked out as a Captain in 1942. He is ALPA liaison representative to CAA/CAB Performance Committee, member IFALPA Performance Study Group.

J. D. SMITH, pilot, Capital Airlines, is also Chairman of the Regional Safety Committee, Air Line Pilots Association. He began flying in 1938, joined Capital in 1945, today has some 10,000:00 total time.

WM. H. WOOLF, Chief Airport Traffic Controller at Newark Airport, began control tower work in 1940 in the Kansas City (Mo.) Tower. He was assigned to his present position at Newark in January, 1948.

Attention is called here to some of the more obvious, but nonetheless frequent sources of trouble that are traceable to the electrical circuits in aircraft

CIRCUIT CONNECTIONS

by William L. Lewis

Western Rep., Guggenheim Aviation Safety Center

The important role electrical apparatus plays in aircraft operations need not be stressed here, as every maintenance technician is aware of this in his daily contact with equipment and circuitry. What is not fully realized, however, is the toll in lives and costly equipment from accidents caused by some simple malfunctioning of a single piece of equipment. Also to consider is loss of aircraft utilization when an air transport is kept out of service until trouble, due to a loose connection, can be located and corrected. This article intends to call attention to some of the more obvious, but nonetheless frequent, sources of trouble traceable to electrical circuits; no attempt will be made at this time to cover the entire field.

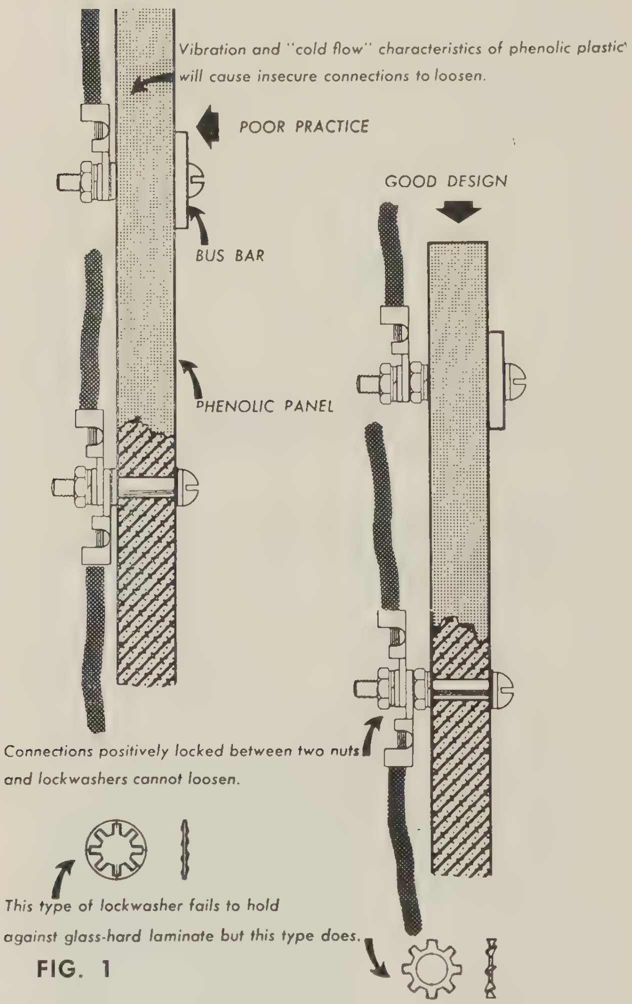


FIG. 1—*Electrical connections in aircraft will loosen and cause trouble unless they are adequately secured. Fire may result from heat produced by loosened high-resistance contact where circuits carrying large current are involved*

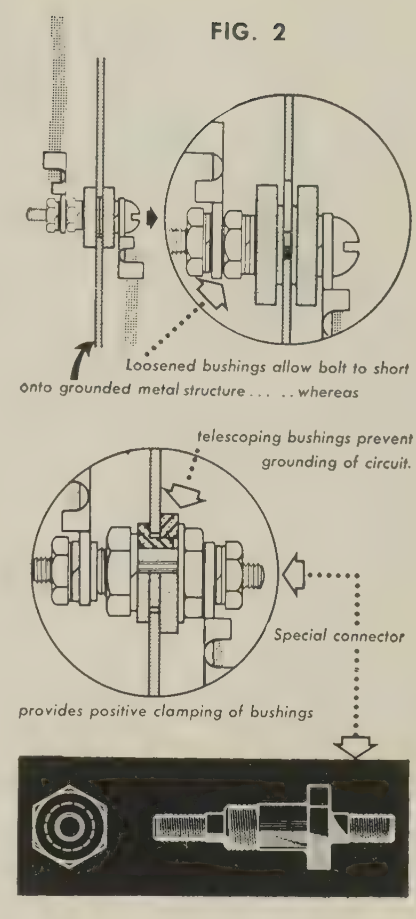
It is unfortunately true that not all electrical equipment is designed with an appreciation for the rigorous conditions under which it must function, despite detailed specifications which are supposed to cover all contingencies. It should be remembered that specification writers are not always endowed with all of the technical knowledge and experience necessary for a complete realization of these conditions. Because of this factor, design errors are likely to be perpetuated until the time comes when drastic action is necessary to correct them. There is often too great a time lag between the recognition of a dangerous situation and its correction via changes in the specifications and ultimately in the design. Until measures necessary to correct a hazardous situation are put into practice, the trouble will continue to occur over and over again. The operators of aircraft should feel a moral obligation to see that information of poor design which comes to their attention is passed back to the designers.

Aeronautical designers want to do a good job; they do and are ever seeking ways and means whereby improvements can be made in design technique to assure maximum reliability of every piece of apparatus going into an airplane. What is lacking, however, is a free exchange of information between the man who does the designing and the man who uses the equipment and who is responsible for its proper maintenance. Therefore, if some of this

FIG. 2—*Connections through bulkheads, especially where only one side can be worked on at a time, are liable to cause trouble from grounding to the metal. A special connector which permits circuits to be connected independently will avoid this hazard*

FIG. 3—*Cross switching of leads can go unnoticed unless positive means are provided which avoid such errors, especially when the leads are very long, as is often the case*

FIG. 2

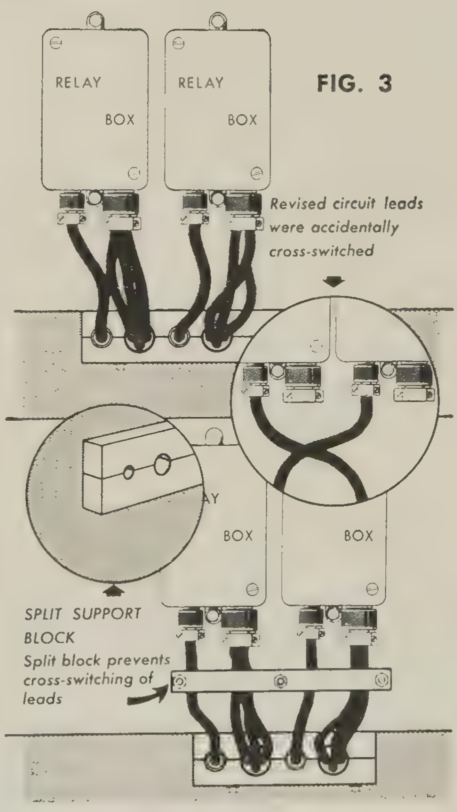


experience can be brought back to the drawing boards and designers are thus made aware of some of the problems of the aircraft operators and maintenance technicians, corrective measures are more likely to be taken.

Some causes of trouble are extremely simple but, as in the case of loose connections, the extent of the trouble is magnified many times on any large or complicated aircraft. Consider, for instance, the extensive use of phenolic plastics as insulating material for panels, relay mountings, etc. Like all materials, they have certain characteristics which need be taken into account when they are put to use. When these limitations are fully recognized by designers and operation technicians, the maximum value of material can be realized and trouble avoided.

Phenolic plastics tend to "cold flow", or change dimensionally when exposed to temperature variations (especially extreme variations) for any length of time. The change in the material is slight and not objectionable providing this characteristic is known and the proper precautions taken. Because of this "cold flow" characteristic, circuit connections will surely loosen unless they are securely clamped between nuts and lockwashers. If, as is too often the case, wire terminals are simply bolted to the panel's surface, they will loosen immediately upon cold flow shrinkage of the panel; vibration will do the rest to make the trouble worse.

The comparison of good practice and dangerously poor practice is shown in Fig. 1. It is decidedly poor practice to clamp wire terminals to the panel. Even lockwashers will not prevent the connection loosening when "cold flow" takes place in the plastic panel. A sure way to prevent loosening from this cause is to secure the screw or stud to the panel independently of the means whereby the wire or cable terminal is connected to the stud. This method has the further advantage of allowing disconnections to be made without disturbing the stud. The stud cannot loosen and be lost and later found to have short- *(Continued on page 39)*



Performance

from the Files of the Flight Safety Foundatior

HAIL: DAMAGE AND AVOIDANCE

Although no fatal airplane accident is known to have been caused solely by hail, this phenomenon has caused severe damage to airplanes, in some cases as much as $25,000 per encounter. Under such circumstances the nose section and the leading edges of the wing and tail are subject to severe damage, and windshields have been broken or cracked to such an extent that pilots feared the normal cruising speeds of the airplanes would cause the broken pieces to be blown into their eyes.

The extent of aircraft damage varies with the mass of the hailstone, the impact velocity, and the type of material hit by the hail. Hailstones less than 0.75-inch in diameter do not cause significant damage at aircraft speeds of between 200 and 300 mph. Calculations from photographs of hail-damaged airplanes indicate that the largest hailstones likely to be encountered in flight are about two inches in diameter.

Pilot Judgment

From the analysis of flight and weather conditions associated with hailstorms, it is evident that, until radar or other hail-detection equipment becomes available, successful hail avoidance is directly dependent upon pilot judgment. In order to exercise good judgment, the pilot should:

1. Be familiar with the occurrence of hail and the effect of hail on aircraft:
2. Know the over-all weather conditions before take-off;
3. Obtain the latest in-flight weather advisories; and
4. Be aware of potential developments so that he can recognize and evaluate them as they occur.

If a pilot has a general understanding of when and where hail forms and the weather conditions associated with hailstorms, he knows when he should discuss hail during preflight weather briefing with the forecaster and when he should require additional pertinent weather information during flight. Unexpected hail encounters could thus be reduced.

"Measure" the Storm

If the location and time of the flight coincide with possible hailstorm conditions, visual pilot observation should be made (if possible) of all thunderstorm clouds that are in line with or directly adjacent to the flight path of the aircraft. Since the degree of severity of a thunderstorm can be associated with the stage of its life cycle, and since hail usually occurs during the mature stage, greater caution should be taken by the pilot when he is flying near or through this stage of the storm.

A mature storm can be described as having

a sharp-edged cauliflower appearance, and usually sharp cloud-to-ground lightning. A dissipating storm can be identified by its wispy-edged appearance and cloud-to-cloud, flickering-type lightning. The disadvantage o decreased visibility during night operations partially overcome by the facts that only 25% of the hailstorms occur during the hours o darkness, and that lightning is more readil visible at night.

Cumulo-Nimbus Clouds

Many military and commercial pilots mak use of visual soft spots in navigating throug cumulo-nimbus clouds. A so-called visual so spot, however, is not always a reliable mea of determining the best path through a thu derstorm, because hail has been reporte occasionally in the clear air outside thunde storm clouds. As a result of recent exper ences of this nature, at least one airli advises pilots to stay away from the edges

cumulo-nimbus clouds when the temperatur at flight altitudes are below freezing.

It should be remembered that although ha may not be encountered by aircraft passi through a thunderstorm, damaging hail m be encountered in another storm within t same general area or at a different altitude the same storm.

Evasive Action

After the airplane enters a thundersto and encounters hail, the pilot must deci whether he should turn to get out of the h area or continue through the hail area on original heading. It appears that, after h is encountered, the type of evasive action be taken depends again on pilot judgme and the decision should be based on known factors regarding the position of t airplane with respect to the storm.

If the flight path is parallel to the edge the storm, a turn is obviously the best so tion. If the relative position of the storm unknown, the best course is to contin through the storm. This course is especial advisable when instrument flight conditio poor radio reception, and other adverse fa tors are involved. The speed of the airpla

PITFALLS

Jerome Lederer and Robert Osborn

er, has a profound effect on the amount
nage sustained, and should be reduced
n as possible.

SURE" FLYING

the downwind leg of the traffic pattern,
lot of a multi-engine transport put the
witch in the "down" position and noted
d "Gear-up" light go out as the gear
started the undercarriage down. Right
t moment, one of the passengers walked
the cabin to the cockpit and asked the
o order a taxi to meet the plane, while
same time clearance for the airplane
d was coming in over the radio and the
tor was trying to straighten out a mis-
standing regarding the taxi order. The

in the meantime was trying to keep
of all this and also keep clear of the
tains at the end of the south runway,
o didn't get back to check for a green
The circuit breaker broke contact with
ear one-third of the way out.

sult: The landing was made with the
only partially down and it retracted
into the nacelle as the weight came
the wheels. Fortunately, there were no
ies to the pilot or two passengers, but
was damage to the props, the lower cowl
s, pitot mast, trailing edge flaps and
mall sections of skin at the rear of the
les.

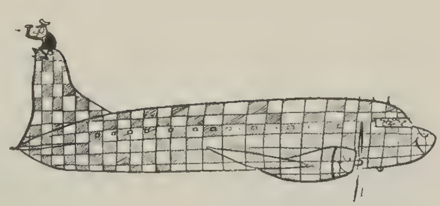
CHECK AND DEMONSTRATION FLIGHTS

We all agree that theoretically there should not be any type of checking, training or demonstration flying in a congested air space. At the same time, however, everyone realizes that from the practical operational point of view, there probably always will be at least a minimum of these types of flights.

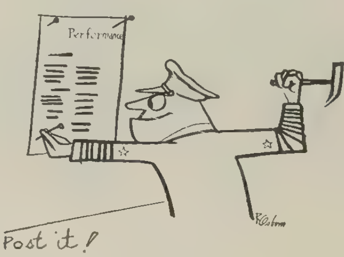
When they must be made, it should be only during daylight hours and when the ceilings and visibilities are generally good. Only under extraordinary circumstances should a check, training or demonstration flight be made with less than 5 miles visibility and with a ceiling of less than 5,000 ft.

Here are some suggested minimum visibilities and altitudes for instrument checks and demonstration flights:

1. Take off with simulated engine failure.........................5 miles Vis.
2. Climbs, climbing turns, and tracking............................5 miles Vis.
3. Steep turns (45°) at 5,000 ft....................................5 miles Vis. (A continuing check for other aircraft by both the third crew member and the check pilot is essential. Doctors, please note: a swivel neck should be required as a physical qualification of the check pilot.)



4. Propeller feathering and unfeathering..............................2,000 ft. Alt. (For the engine out go-around and a two-engine approach and pull out, it's a good idea to use 2,000 ft. as the airport level.)
5. Slow flight, straight-and-level, normal turns..........................5,000 ft. Alt.
6. Approach to stall and recovery from unusual position.................................5,000 ft. Alt.
7. Rapid descent of 1,000 ft. with a 30° bank and 180° change in heading, start at 5,000 ft.
8. Emergency procedures, such as fire control, etc.................2,000 ft. Alt.
9. Initial approach, procedure turn, possibility of one engine out (throttle back only), final approach and descent to authorized minimum and missed-approach pull-up. ... Regular altitude / 5 miles vis.



The suggested minimums should prevail at the training or checking area. If a smoke condition exists, there is no reason why the work cannot be done at least 500 on top away from all airways.

If the visibility should be under 5 miles, the tower should work the approaches or at least keep all the aircraft making simulated approaches advised of the location of other training aircraft.

Flights of these types should carry at least one extra crew member in addition to the check pilot to insure a constant observation of the path and the intended path of the maneuver. The difficulty of seeing out of some cockpits is partly offset if you

STOP, LOOK and CHECK.

CREW SCHEDULING

From a safety standpoint, incidents have been reported where there have been breakdowns in the tie between management and pilots in crew scheduling. In one instance a pilot was assigned to a flight in a newly acquired airplane with a crew the pilot had never before flown with, and the flight was to an airport none of the crew had flown to in more than a year. More than that, the flight was scheduled to be made at night and the weather at that particular time was 300 and one.

Fortunately, everything turned out all right, but . . . and it's a big but . . . it was due to pilot and crew efficiency, not to management care in making assignments.

SKYWAYS FOR BUSINESS

NEWS NOTES FOR PILOTS, PLANE OWNERS OPERATING AIRCRAFT IN THE INTEREST OF BUSINES

HELICOPTER, *used for aerial seeding by Sinclair Coal Co., recently delivered Sequoyah mine superintendent, Frank Podpechan (above), to Will Rogers Hotel in Claremore, Okla.*

Sinclair Coal Co. Uses 'Copter in Mine-Area Seeding Operation

Kansas City, Mo. Aviation plays a dual role, and both of them important, in the operations of the Sinclair Coal Co., Kansas City. For business trips the company owns and operates its own fleet of aircraft, including a recently acquired executive DC-3. But the other use Sinclair Coal makes of aviation usually comes as a surprise to most people, and that's aerial seeding.

With extensive mining properties in several states, Sinclair Coal is a substantial land owner, and in the vicinities of its holdings which are being worked as mines, the company has large farm acreages which may later be developed for coal production. As a consequence, Sinclair has become one of the nation's principal users of aerial seeding.

Sinclair recently demonstrated its utilization of aviation at Claremore, Okla. Hundreds of citizens at Claremore watched the proceedings as Oklahoma's first helicopter landing on a hotel roof gave the Will Rogers Hotel the distinction of being the only "Heliport Hotel" in the state. Frank Podpechan, superintendent of the Sequoyah mine, a Sinclair property near Claremore, was the passenger delivered directly to his hotel by veteran 'copter pilot, Al Luke. The landing was made in the smallest known area in which a helicopter has set down atop a hotel. But it was not without its share of "crises".

The evening before the scheduled landing atop the hotel, it was discovered that the city had on its books an ordinance prohibiting landings on the Will Rogers Hotel. Oddly, the ordinance applied specifically to that hotel. Then, in checking the landing area on the roof, it was found that the clearance was so close a television aerial on an adjacent building would have to be removed.

On the following afternoon, however, the helicopter with its passenger made a successful landing after a busy morning during which the city ordinance was repealed, the television antenna removed and a white cross landing marker painted on top of the hotel.

Following this transportation demonstration, the specially-equipped seeding helicopter carried out the sowing program for which it had been sent to the area. At a selected spot on the mine property, the 'copter was loade with a special mixture of grass and legun seed to be spread on adjacent farm lands well as on the mine property. One-thousar acres were sown at the rate of 15 pounds p acre. Each seeding flight required from fi to seven minutes and sowed 400 pounds seed. After the seeding job at the Sequoya mine, the helicopter flew to three addition coal mine areas in Missouri where 56,0 pounds of seed were distributed.

Sinclair Coal Company has used the hel copter for seeding for several years.

Magnolia Flies News Group to View Mobilgas Economy Run

Dallas, Texas. Magnolia Petroleum Cor pany's DC-3 enabled officials of the oil co pany and a group of Texas newspapermen keep tabs on the automobiles entered in the f mous Mobilgas Economy Run, a gruelli test of both vehicle and fuel. Those gues aboard Magnolia's deluxe executive DC when it took off from Southwest Airmoti at Love Field, Dallas, for a birdseye view the run were *(see photo below, left to righ* John Terrell, Magnolia public relations d rector: Don McIver, Dallas *News* busine editor; Don Hinga, Houston *Chronicle;* F Williams, Magnolia's assistant marketi manager; Robert Carter, Magnolia adverti ing director; Charles Boatner, city editor Fort Worth *Star Telegram;* Bill Bellam managing editor of San Antonio *Expres* Guy Tate, Magnolia's vice president charge of marketing; James Clark, Houst *Post* business editor. The airborne group fo lowed the run from Los Angeles to Ren Nev., Boise, and Sun Valley, Idaho.

MAGNOLIA *officials and Texas newsmen took off from Southwest Airmotive Love Field, Dallas in Magnolia's DC-3 for an aerial view of the well-known Mobilgas Economy Ru*

y Safety Device Warns ts of Oil Pressure Loss

terboro, N.J. A new safety device an-iced by Van Dusen Aircraft Supplies of ieapolis, Teterboro and Boston, promises elp remove worry lines from the pilot's . This new device flashes a red warning the instant oil pressure drops to the er point or below, and thus gives the ample time to locate an emergency land-spot before complete power failure. wn as the "Van Dusen-Thompson Safety ," the device also has other useful func-. It serves as a reminder to the pilot to off his master switch before leaving the e. Failure to turn off the master switch n results in a dead battery, ruining of the ery in freezing weather or even fire with loss. The Safety Unit also serves as a k on the Solenoid. If the master switch rned off but the red warning light of the ty Unit continues to burn, the pilot ws the Solenoid is defective.

lso, by wiring the Safety Unit through stall warning unit, landing light motor irn-and-bank, the circuit for any of these utomatically verified if the warning light tions properly.

his device, developed for Van Dusen by Thompson of Meridan Aircraft, Meridan, n., consists of a special type red warning t mounted on the instrument panel. The t is actuated by a low-pressure switch in-ed by means of a Tee connection im-iately behind the oil pressure gauge re the oil pressure line connects. The h operates at 4 to 6 lbs pressure.

stallation of the Safety Unit can be made ess than an hour; CAA approved.

ing Costs Force Spartan Ser-e Charges Up Some 15 Percent

ulsa, Okla. After several years of hold-the line on hourly and fixed-price rates maintenance service, Spartan Aircraft npany's Aviation Service Division has had give in to the ole debbil rising cost of r, material, equipment, utilities, insur-, etc., and raise its rates. For all work ght to Spartan after last April 15, Spar-s Aircraft Department and Engine De-ment work has been charged at $3.75 hour; Radio and Instrument work has n charged at the rate of $4.00 per hour, Machine Shop work at $4.25 per hour. ntil Spartan publishes a new fixed price the old list will be used with an in-se of 15% in charges. According to re-, Spartan's new charges are still below se normally asked at most service centers.

ffalo Airport Provides eeing Eye" for Aircraft

uffalo, N.Y. A recent innovation at Buf-Municipal Airport is a "seeing-eye" car airplanes moving on the ground. The car, Willys station wagon painted red with te roof markings and equipped with red nker lights and a roof-mounted spotlight, des planes on and off the runways or in out of parking areas day and night. It on directions from the control tower.

....in the Business Hangar

R. E. Vertel, chief pilot for Potter Aircraft Service, Inc., of Burbank, Cal., worked the front office of the Havenstrite Oil Company's executive DC-3 on a trip to Nassau and back. Vertel replaced Vic Russell, Havenstrite's chief pilot who was recuperating in the hospital at the time of the trip. Co-pilot on the aerial junket was Irv Redfern of Havenstrite.

Aerodex, Inc., Miami, claims a record in overhaul. The company recently completed a major 8,000-hour overhaul on a DC-3 in 18½ days.

Randy Mulherin, chief pilot and company CAOA representative, brought Crane Company's DC-3 (N 6201B) to AiResearch Service for 100-hour inspection and landing gear rework. Home base for Crane Company's two DC-3's is O'Hare Airport, Park Ridge, Ill.

Fruehauf Trailers have taken delivery of their Pacific Airmotive-overhauled Lockheed *Lodestar.* PAC's work included wing and empennage removal for inspection and overhaul of major components, 100-hour inspection of fuselage structure and engines, annual relicense and a complete paint job. Now that this *Lodestar* is back flying, Fruehauf's second *Lodestar* is at PAC for similar overhaul.

Algona Steel Corporation's Twin-Beech now is equipped with two Flite-Tronics CA-1 Audio Distribution Amplifiers. Carl Hauser, pilot for Algona Steel, had the installation made by Technical Enterprises, Ltd., Malton, Ontario.

Paul Mantz brought his B-25 to Butler Aviation's new plant at LaGuardia for extensive modification. A new Cinerama film is in the process of being made and Paul is doing the flying.

Wyandotte Chemical Corporation's Lockheed *Lodestar* (N 33362) has been at the Greenville plane of Temco Aircraft for a fuel-tank reseal. C. R. Schenck is Wyandotte's pilot.

A Collins, an ARC and a Lear custom radio installation was made recently in a Lockheed 14 owned and operated by Sparling-Davis Co., Ltd., Edmonton, Alberta, Canada. The radio work and installation of a new instrument panel was done by Aircraft Radio and Accessory Co., Stapleton Airfield, Denver, Colo.

Two more executive versions of the Douglas B-26 *Invader* were sold to the French Government recently by William C. Wold Associates. This makes the fourth B-26 Bill Wold has sold to the French.

Conversion of Potlatch Forests' *Lodestar* has been underway in PAC's Aircraft and Equipment Division. Under the supervision of Chief Pilot Clyde Martin, the *Lodestar* underwent an 8,000-hour inspection and installation of new radio equipment in addition to the interior conversion. Fuel tank seal was done by Aircraft Tank Service, Burbank.

Signal Oil Company's executive DC-3 is back in the air after special wing modification by Potter Aircraft Service, Inc. Orlin Sorensen is the plane's captain; Wm. Walkup is CAOA representative.

Steve Brown and Leonard Lee, Continental Can Company pilots, brought their B-26 to AiResearch Aviation for modifications, new paint job and new engines.

Southwest Aircraft's *Lodestar*, owned by Wyatt C. Hedrick, has had a Flite-Tronics MC-3 Marker Beacon receiver installed by Wilson Radio Company, Meacham Field, Fort Worth, Texas.

Dell Webb's *Lodestar* is in the Pacific Airmotive hangar for 100-hour inspection and overhaul, tank sealing and an engine change. The Irwin Lyons Lumber Company's Twin-Beech is also in the PAC hangar for an engine change.

CAOA report

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the members firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. CAOA headquarters are located at 1029 Vermont Ave., N. W. Washington 5, D.C. Phone: National 8-0804.

CAOA Chairman Scores CAA "Inertia"

Corporation Aircraft Owners Association Board Chairman, Cole H. Morrow, urged that the Civil Aeronautics Administration "get out of the rut of human inertia" and develop the needed policies and procedures whereby modern navigation equipment already purchased and installed by corporation aircraft owners can be used to its full extent. Speaking before the Radio Technical Commission for Aeronautics Spring Assembly Meeting in Washington, D.C., Morrow charged that it is time that we stopped letting the tail wag the dog by allowing "Model T" types of requirements dictate the policies and practices for all operations.

Morrow cited several examples to back up his charges, one at Detroit and another at Washington, D.C., where such procedures are needed immediately. At Detroit, Morrow said, corporation aircraft flying Cleveland-Detroit arrive over Windsor at 10,000 feet and wait "sometimes for hours" for want of an approved procedure to get down, when the answer is so simple (using VOR) that it could be worked out in five minutes. Similarly, at Washington National Airport an aircraft equipped with modern VHF and VOR installations arriving over Herndon, Va., just cannot get into the Washington National traffic pattern if the airport radar is not operating.

CAOA Sponsors Meeting to Discuss Air Traffic Control Problem

There are some 23 corporations that base a total of 50 multi-engine airplanes at Detroit City Airport, Michigan. Many of them are CAOA members. Pilots employed by these companies recently met for the purpose of discussing the possibility of forming a group or committee to promote safety and efficiency. It was unanimously agreed that the primary problem concerned instrument approaches and departures at Detroit City Airport. It was recognized that there are many complications due to the proximity of Detroit City Airport to Wayne and Willow Run. However, it was felt that many times unnecessary delays were experienced, such as being "held" or cleared to Windsor at higher altitudes than justified. Accordingly, representatives of the various Air Traffic Control Agencies were invited to meet with representatives of the pilot group to discuss mutual problems. Full details of the meeting will be presented in a subsequent CAOA Report.

Airtex Reduces Noise Level in Beech D18S

Passenger comfort is of foremost concern to all business pilots. CAOA member, Airtex Corporation of Spartanburg, South Carolina, wrote us recently that they had discovered a method of reducing the noise level in the cabin of the D18S. In addition to "super soundproofing," Airtex has perfected in a new way the old idea of installing double windows, thus reducing the noise level approximately 25%. Airtex indicates that normal conversation is possible without raising the voice to override engine noise. Airtex already has installed the special windows in a number of CAOA member aircraft. Pilots of these planes have verified a big improvement in passenger comfort.

According to Airtex, the price of these double windows is $100 F.O.B. Atlanta, Georgia, or Spartanburg, South Carolina. If installed by Airtex, there is a charge of $25.00. The double windows are of plexiglass, identical to the original installation. No alteration, no screws and no clamps are used. Please direct inquiries concerning this to Ben J. Mangina, Airtex Corporation, Spartanburg, South Carolina.

Special CAR Proposed for DC-3, Lockheed L-18

At long last, the considerable work done by National Headquarters of CAOA and several of its leading members, has materially helped in bringing about the issuance by CAB of a Special Civil Air Regulation which will permit the modification and recertification of the DC-3 and Lockheed L-18. Since 1937, these aircraft have been the only two multi-engine types in use which still are operating under the original certificate promulgated by the then Bureau of Air Commerce in Bulletin 7A.

The proposed new Special CAR would provide in substance the following:

1. *General modifications.*—Contrary provisions of the Civil Air Regulations regarding certification notwithstanding, if moc cations are made to Douglas DC-3 or Lo heed L-18 airplane types which result changes in design or in changes to appro limitations, such modifications shall be m in accordance with the rules of Part 4a the Civil Air Regulations applicable to modification being made.

2. *Specific conditions for approval*—Wh the following specific changes are made DC-3 or L-18 airplanes, the airplane sh meet the designated sections of Part 4a;

(A) If the take-off power limitation is creased beyond 1200 hp per engine, com ance shall be shown with the transport ca gory flight characteristics requirements p scribed in sections 4a.751-T through 4a.75

(B) If engines, other than those presen approved for installation on the airplane, installed which have a displacement grea than 1830 cubic inches or which necessit a major modification or redesign of the gine installation, compliance shall be sho with the powerplant installation requireme prescribed in sections 4a.591 through 4a.6

(C) For approval of a maximum cert cated take-off weight greater than 26, pounds for the DC-3 and 19,500 pounds the L-18, compliance shall be shown with structural requirements prescribed in s tions 4a.61 through 4a.299.

3. *Recertification under transport categ performance rules*—When it is sought to tablish new maximum certificated weig for DC-3 or L-18 airplanes:

(A) The airplane shall be recertifica and the maximum certificated weights est lished in accordance with the transport ca gory performance requirements prescribed sections 4a.737-T through 4a.750-T. (No Transport category performance requireme result in the establishment of maximum c tificated weights for various altitudes.)

(B) For each airplane recertificated accordance with paragraph (A), an airpla flight manual, approved by the Administ tor, shall be provided containing the app cable information prescribed in secti 4a.760-T and information which will ena the application of the take-off, enroute, a landing limitations prescribed for transp category airplanes.

(C) Each airplane recertificated in cordance with paragraph (A) shall be op ated in compliance with the transport ca gory performance operating limitations plicable to the operations being conduct

4. *References.* All references in this r ulation to Part 4a are those in effect at time of modification or recertification.

50th Anniversary of Power Flight Committee Offers Sugge tions for Business Participati

National Headquarters of the 50th An versary of Powered Flight advises that th have available material containing many s gestions regarding participation by CA members as well as non-members in the ce bration of the Wright Brothers epoch fli at Kitty Hawk, North Carolina, in 1903. T material includes a reproduction proof the official insignia which corporations a companies are using in house organs and a vertising. Also, there is a suggestion sh describing methods of participation thro publicity, advertising, speakers, exhib open house for the public, etc. In additi there is a speech outline, based on Gene

plittle's December, 1952 speech, to assist planning appropriate talks on the 50th niversary. General Doolittle of Shell Oil mpany, a CAOA member, is Chairman of National Executive Committee that has anized and is sponsoring the nationwide ebration.

Copies of the above described material be obtained by writing to:

50th Anniversary of Powered Flight
National Headquarters
1405 G Street, N.W.
Washington 5, D.C.

Business organizations owning and operng aircraft are urged to contact the above re for helpful suggestions on how they y give valuable assistance in carrying out national anniversary program.

S. - Canadian Flights mplified by Agreement

On April 15, flights from the United States Canada by pilots of business or private craft, were simplified as the result of an reement between the two countries.

This new agreement is an expansion of U.S.-Canadian Customs Transborder ht notification service, making it available pilots flying in either direction across the rder. Initially set up February 28, 1951, service up to now has been available only pilots flying to the U.S. from Canada.

Under the extended service, a pilot of her country will merely file a flight plan h either a Civil Aeronautics Administra- communications station or a Canadian partment of Transport Aeronautical comnications facility, depending on the direc- of his flight. These facilities will for-d the flight notification data without arge across the border to the CAA or DOT ility nearest to the airport of destination. e CAA or DOT facility in turn will notify Customs Service, and Customs then will ify all other border inspection agencies ncerned.

Other than filing a flight plan, the only uirements for pilots taking advantage of flight notification service will be to inde the number of aliens and number of zens aboard the aircraft and to request CAA or DOT to advise the Customs Serv-s. In all cases the flight plan will serve as ification of arrival, relieving the pilot of t responsibility.

The flight notification procedure, which s negotiated by the CAA and the Canadian partment of Transport, applies only when first intended landing is made at the airports where the service is available in U.S. and the 22 airports so designated by Canadian Government. Pilots wishing to d elsewhere must make their own arrangents with inspection agencies of the counto be visited.

Following is the complete list of airports ere trans-border flight notification service available:

S. Airports

Akron Municipal, Ohio; Albany Municipal, N.Y.; Baudette Municipal, Minn.; Bellingham Municipal, Wash.; Buffalo Municipal, N.Y.; Burlington Municipal, Vt.; Caribou Municipal, Me.; Cleveland Municipal, Ohio; Cut Bank Municipal, Mont.; Detroit Municipal and Wayne Major, Mich.; Duluth Municipal, Minn.; Grand Forks Municipal, N.Dak.; Great Falls Airport, Mont.; Havre Hill County Airport, Mont.; International Falls Airport, Minn.; Malone-Dufort Airport, N.Y.; Massena (Richards Airport), N.Y.; Gen. Mitchell Airport, Milwaukee, Wis.; Port O'Minot, N.Dak.; Niagara Falls Airport, N.Y.; Ogdensburg Municipal, N.Y.; D'Arcy Scott Airport, Oroville, Wash.; O'Hare Field, Park Ridge, Ill.; Fort Pembina Airport, Pembina, N. Dak.; Portal Airport, N.Dak.; Port Townsend Airport, Wash.; Put-in-Bay Airport, Ohio; Rochester Municipal, N.Y.; Rouses Point Airport, N.Y.; Sandusky Airport, Ohio; Saulte Sainte Marie and Kinross Field, Mich.; Seattle-Tacoma Airport, Seattle, Wash.; Geiger Field and Feltz Field, Spokane, Wash.; Richard Bon Airport, Superior, Wis.; Warren R. Austin Airport, Swanton, Vt.; Hancock Airport, Syracuse, N.Y.; Franklin, National and Toledo Municipal, Ohio; Watertown Municipal, N.Y.

Canadian Airports

Yarmouth, Moncton, Saint John, Montreal, Quebec, Fort William, Kenora, London, Ottawa, Toronto, Windsor, Winnipeg, Regina, Calgary, Edmonton, Lethbridge, Penticton, Port Hardy, Sandspit; Vancouver, Victoria, and White Horse.

MATS Commander Requests COAO Program "CIRVIS"

The Commander of the Military Air Transport Service has requested that CAOA assistance be given to the USAF in the civil aircraft phase of the armed forces program of communications instructions for world-wide reporting of vital sightings from aircraft—better known as the "CIRVIS" Program.

Briefly, CIRVIS is a system whereby the pilots of all U.S. Military and civil aircraft are given a procedure by which they, when they deem it necessary in the interest of national security, may report visual sightings of guided missiles, unidentified flying objects, formations of aircraft, submarines, and surface vessels. This procedure is set out in the Cirvis Extract booklet.

It is the hope of the USAF that all CAOA member pilots will be developed as Cirvis reporting sources. In July 1952 this extract was first distributed to a limited number of civil airlines. Efforts now are being made to re-emphasize Cirvis to those pilots who have knowledge of it and to introduce Cirvis to all pilots not presently aware of the program.

On request, MATS Headquarters, Washington 25, D.C., will furnish copies of Cirvis Extracts.

CLEVELAND CAP CO.

The Cleveland Cap Screw Company, of Cleveland, Ohio, makers of industrial fasteners, owns and operates a Beech D18S (*above*) which was delivered new to them from the factory in March, 1952. This busy company plane is powered by two Pratt & Whitney R-985 AN-14B engines, and is equipped with Bendix TA-18 transmitter and dual omni. Used primarily for business flights in areas east of the Mississippi, the Twin Beech is flown an average of 40 hours a month.

W. E. Jeavons (*on left, photo right*) is pilot of the Cleveland Cap airplane, and George Bricmont (*right*) is his copilot. The company is a member of the Corporation Aircraft Owners Association, and Bill Jeavons is its CAOA representative.


LEADERSHIP
DEMANDS
CONSTANT
ACHIEVEMENT
More defense
for yo

'ly VOR Airways n the Centerline!

A recent change in the Civil Air Reg- lations Part 60.45 highlights a differ- ıce in the techniques of en route IFR ying that does not appear to be too ell understood despite its simplicity.

Pilots often acquire habits that are ard to shake. Few pilots today fail to omply with the rule that LF airways hould be flown slightly to the right, as 1 the bi-signal or twi-light zone. Even hen, the assurance of ATC separation ertically between opposite direction raffic eases the mind of the pilot who kes to hug the solid signal of the on- ourse, or occasionally even drifts over the left side. (Don't scoff! Radar ırveillance has revealed that any re- mblance between the supposed track nd the actual track is often pure coin- dence and not the fault of the happily isposed pilot!)

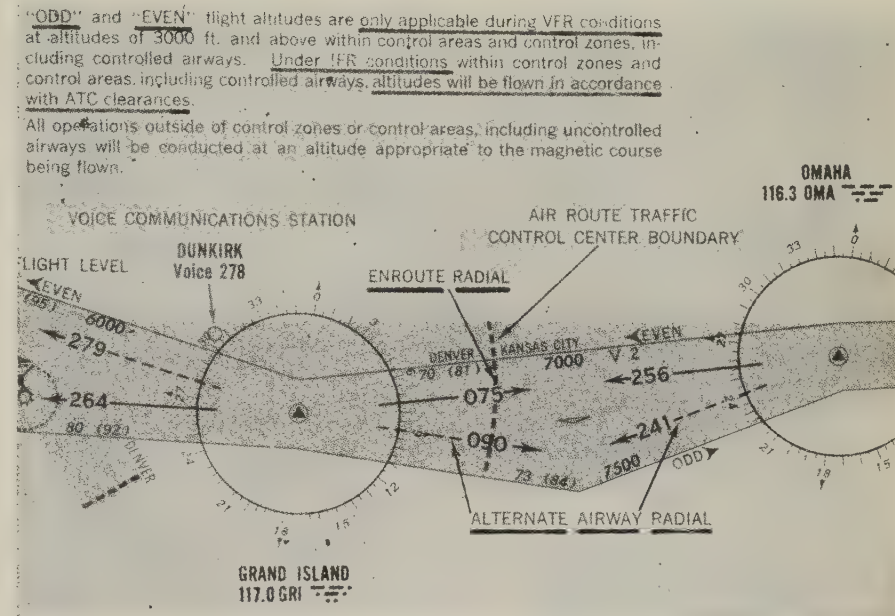
With the introduction of the Victor irways, it was explicitly explained that was practical to establish a procedure r en route altitude changes via diverg- ıg track radials and, therefore, it was xpected that an en route flight main- aining an approved level altitude could ke unto itself the exclusive use of the enter-line radial at the altitude. In ct, any tendency to hold a course too ır to the right until the hoped-for day hen DME makes multiple parallel acks operational, is to run the risk of ngling with faster aircraft changing ltitude on a divergent radial.

So, fly that center-line radial on VOR's nless otherwise instructed.

Iiami Area Hampered y Lack of Facilities

Despite a steady growth in traffic that ids fair to rival the records of such air affic hubs as New York and Chicago, a emingly insolvable problem confronts Iiami, a gateway to the Caribbean and outh America.

Although bragging of their admirably igh percentage of fair flying weather, ie density of traffic attracted to this rea by both domestic seasonal trade and ıternational year-round trade poses a ifficult problem during the infrequent mes that instrument conditions exist. 'he so-called "Miami season" has spread ut from the three original months of 'inter (December, January, February) take in the months from November



through April. The threefold increase in the carriers serving this trade plus the multiplication of the international traffic making connections at this point insures a high backlog of traffic everytime IFR or even marginal weather sets in.

In January, the tower logged only 246 instrument approaches at an average landing interval of 4.3 minutes where successive aircraft followed each other on instrument approach. The total delay time for those 246 aircraft was *over 28 hours*, or an average of 7 minutes per approach! This does *not* mean inefficiency of either pilots or controllers, but rather reflects the "stretchout" of time consumed in waiting for aircraft on approach to reach a point where successive aircraft can be cleared to start approach, often from an awkward position! (In the same month, the Center positioned 320 aircraft in the various approach holding patterns or into the approach lanes for the tower and approach control to handle and again, principally due to the awkward and long distances involved, over 31 hours were consumed in delays to landing aircraft at all airports in the Miami area.)

The airport serving all this traffic is ample in both size and ramp facilities, although additional efforts are contemplated to further it. The two factors that are *not* showing any hope for future improvement and reduced delays in instrument periods are the lack of sufficient and adequately dispersed radio facilities and an apparent unwillingness on the part of the principal users, the air-carriers, to make concessions leading to a solution of the problem.

In the first instance, the sole facilities available for instrument approach (the LF range plus one bone-marker on the initial approach course, a VOR range and an ILS, plus Compass Locator at the Outer Marker only) are all aligned with a one-direction approach, landing East. At first glance, it would appear that only fair winds blow from the West at Miami!

Unfortunately, such is not always the case. Along with the unorthodox performance of the weather in other parts of the nation in the last few years, Miami has been getting its share, and for the comparatively low total of all instrument approaches shown, a disproportionate amount of delay time has been increasingly evident.

Straight-in minimums are quite satisfactory, but when circling approaches must be made to land into winds other than East (quite frequently with low visibilities), the penalty of the higher minimums makes itself felt. Proposals have been made many times to re-distribute certain of the approach facilities to ease this problem, such as locating the LF range just East or Southeast of the airport, or a marker or Comlo facility in this direction to enable any approach from the East to determine a point at which to start safe final letdown. Suggestions have been made for use of certain of the island Keys or a built-up site in Biscayne Bay. Unfortunately, the area East of the airport is not only cluttered

(Continued on page 36)

Miami Area Hampered by Lack of Facilities

(Continued from page 35)

up with tall buildings but with numerous radio station masts that would be just as useful to the community if they were located elsewhere than on the easterly approaches to the airport.

For this reason, opponents to any plan to develop an approach from the East have made the point that straight-in minimums would have to be at least as high as the afore-mentioned circling minimums. Technically this is so, although a facility pointing Southeast could be located approximately a mile from the beginning of runways 30 and 27 in a comparatively undeveloped area with an initial descent facility located on Virginia Key or Key Biscayne, a distance of six or seven miles further out.

Although less tangible but possibly more potent in discouraging the development of any such easterly approach involving a relocation of any of the present facilities, is the fact that some of the major users of the airport conduct virtually all their pilot training and proficiency flight programs in the Miami area. The screams that might arise from the "Gold Coast" residents in season if there were a stream of multi-engine aircraft droning overhead on low approach via the Beach and Collins Ave. at Lincoln Road have probably had many an airline head in hopeful prayer the night before an area airspace meeting.

With due respect, however, to these civic-minded executives, their experiences with the New York airports last year might have suggested to them that Homestead range and airport, only 20 miles south of Miami is not only ideal for LF range practice but a good deal closer than MacArthur Field on Long Island is to LaGuardia, Newark and Idlewild!

One of the other factors hampering the instrument problem is the dearth of adequately equipped holding points in the Miami area. From the standpoint of a descending pattern to feed the instrument approach, the current use of Tamiami and Belle Glade intersections, respectively 30 and 63 miles away, is frustrating to both ATC controllers and to pilots awaiting approach clearance.

In this respect, Bayshore intersection and Sands intersection (with a relocated LF range and Southeast course) would serve an approach from the East or Southeast. It would appear that even additional Compass Locator stations judiciously placed would help expedite the present set-up, but budgetary considerations preclude even that often-promised relief. Other locations in the Second Region of CAA are equally loud in their cries for these treasured facilities, and Miami people have learned to anticipate the explanation that "you only have VFR in Miami!"

Jacksonville has only recently acquired its Airport Surveillance Radar and Miami could solve much of its problem with this fascinating gadget. The recent cut-back in the plans for the proposed installations throughout the country may affect Miami also.

As if this wasn't enough headache, personnel shortage problems in Center and Tower exaggerate the situation. It is difficult enough to cope with the above-described problems of approach facilities without being aggravated by the fact that too few controllers are available to handle too few frequencies, making impossible the splitting of control so commonly practiced at other locations during periods of peak loads! Even a small improvement in each of the factors involved would go a long way toward expediting the flow of traffic and shorten intervals.

In any case, if the continued build-up in traffic and uncooperative weather combine to force the situation, some solution will have to be found or a good percentage of the traffic will have to be diverted to other points whenever there is even the slightest threat of instrument conditions.

Radar Transition—Newark to Teterboro

One of the problems, both navigation and ATC-wise, in multi-airport terminal areas is the limited airspace available for holding and approach patterns. In many instances, it has been necessary to limit the instrument activities at some fields in favor of higher density neighboring fields. Higher minimums, requirements of VFR transitions from an IFR approach at the bigger field to the smaller airport pattern, and subsequent cancellations or delays have been the rule.

With the introduction of radar approach control as well as the long-established radar instrument approach, it has been possible to expand the service of this instrument and enable virtually simultaneous approaches to two or more neighboring facilities plus easy transition without excessively high minimums being imposed or additional radio facilities.

The latest example of this is the Teterboro-Newark setup. Because of the heavy West and Southwest bound traffic in and out of LaGuardia, Idlewild and Newark, ATC has been at a loss for sufficient airspace to create holding patterns for both Newark and Teterboro landing traffic. The weight of traffic being what it is, it was an achievement to find altitudes and lateral airspace and facilities with which to hold traffic for approach at Newark. For a considerable while, all Teterboro-bound IFR traffic had to accept either approach and landing at Newark, approach to Newark and VFR restrictions to Teterboro, or long delay plus additional excessive delay to all subsequent Newark traffic until ATC was satisfied that the Teterboro landing had been accomplished.

Radar has considerably changed that. Although most of the direct transitions to the Teterboro ILS still are not always possible from all directions, due to the climbing and descending traffic almost continuously present on the surrounding airways, it may soon become more frequent with the assistance of radar at Newark and the re-installation of the Teterboro Outer Marker Compass Locator either at the old site or at the Orange intersection of the ILS with the Northwest course of Idlewild range.

For the present, it is now possible to file for Teterboro as a destination with IFR limits and anticipate landing there albeit via Newark, but with considerably less delay. In short, Newark Radar is picking Teterboro flights out of the Newark ILS Outer Marker holding pattern and vectoring the aircraft to the Teterboro ILS approach Southwest of the TEB Outer Marker. Also, a Northbound flight approaching the Newark Range on Amber 7 may be similarly vectored direct to the Teterboro ILS. The aircraft is treated exactly the same as a Newark-landing flight with respect to sequence and neither Newark nor the flight normally suffer excessive delay due to the fact that the status of the Teterboro approach is known at all times and assured separation from subsequent Newark approaches makes shorter intervals possible.

Revised Definition of "Ceiling"

Another recent change in CAR 60.72, already familiar to airways and air traffic personnel, weather bureau and most scheduled airline personnel, may justify a little more discussion for the benefit of others of the flying public. Pilots of all categories often have been influenced by ground personnel and have been known to pass up approach opportunities when actual reported weather was adequate for legal approach.

The revised regulation defines "ceiling" as the height above ground or water of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast" or "obscuration," *and not classified as "thin" or "partial".*

Hence, regardless of the height of the first layers, *when reported* as "thin" or "partial," they do *not* constitute the ceiling for purposes of applying minimums and the pilot should refer to the subsequent, if any, layer for determining his right of approach, keeping in mind the approach visibility reduction inherent in the presence of the lower clouds

VFR Altitude Regulations and 500-on-Top Under Fire

For some time, current regulations have required that pilots engaging in VFR flight along the country's airways at altitudes above 3,000 feet, adhere to the prescribed compass quadrantal recommended altitudes, such as East- and Northbound at odd altitudes, and West- and Southbound at even altitudes. Similarly, a specific guide for crossing airways and flying off airways starting with odd thousands and adding 500 feet for each successive 90° of the compass going clockwise, was studied by every pilot. Further, it has long been established that the practice of operating at a minimum of 500 feet above a well-defined cloud top constituted VFR flying for the period of the time that such a flight-level was maintained.

In all the three above instances, by all the familiar definitions, the inference was drawn and relied upon that the implied safety of so-called VFR flight was present and, of course, that the pilot was equal to the problem of providing his own separation from the hazards of collision.

In the last few years, the mounting total of in-flight collisions (almost exclusively under VFR conditions) plus the less publicized but frightening figures for "near-collisions" has stirred up considerable controversy. In a recent Round Table in SKYWAYS (*April, 1953*) the subject of radar traffic control and separation and the evident need of stretching the current "3-mile" VFR to 5 miles in congested terminal areas was well discussed and need not be repeated at this time.

A more immediate and specific problem is presented by the fact that in many collision instances, there has been the obvious fact that a faster aircraft overtook an unseen slower aircraft. The facts of human limitations in the powers of observation may indicate that the theory of reducing the rate of closure between two aircraft by having both fly in the same general direction at the same altitude may be less important in these days of airline aircraft cruising at 300 mph compared with lighter aircraft cruising in the vicinity of 100 mph, plus the obvious disadvantage of the latter not having eyes in the back of its head. With a possible acceptance of the evident need for increasing VFR specifications to five miles, it might be advisable to reverse the book slightly and required VFR traffic on the airways to fly altitude levels in opposition to IFR-plan, traffic operating in VFR conditions, or add 500 feet to the enroute altitude while on airways!

Secondly, in the heavily congested terminal areas, the exigencies of separation of IFR-plan traffic has compelled ATC to arbitrarily assign specific altitudes while within an average of 50 miles of the terminals, which altitudes bear no relationship whatsoever to the quadrantal system, IFR or VFR, and hence literally force a situation where the IFR-plan aircraft is flying in direct contradiction to the regulation, although not engaged in climbing or descent! What the legal liability aspect of this would be in the event of a catastrophic mid-air collision, with all parties looking desperately for a scapegoat, can only be imagined.

Conceding the urgency of ATC's problems in true IFR conditions, it is nevertheless impossible to expect VFR traffic in VFR conditions to anticipate the above-mentioned situation, nor is it enough to comment that the VFR traffic is responsible for avoiding collision. Proof of this lies in the fact that the airline pilots, admittedly peers in the art, from sad experience are becoming increasingly reluctant to accept responsibility for their own separation in VFR conditions and are insisting upon radar assistance where available to spot traffic even in CAVU!

The problem of cockpit blind spots at all attitudes, especially while climbing VFR, has been publicly discussed. It has recently become apparent that while separation on full instruments is only guaranteed by ATC to the limited extent of known traffic and the adherence capability of all pilots, the threat of collision VFR is far greater than IFR. Hence, the current solution can only be *more eyes looking with more necks swiveling.*

The third category of VFR flight under fire is that much-abused "500 feet on top," whether "on top" of smoke, haze or cloud. Too often, pilots have been known to literally interpret this as authority for a nice, convenient cruise level literally skimming the top of such a condition. The all important prefix words *"at least"* making the phrase read "at least 500 feet on top" have either fallen into disuse or have been studiously ignored.

The result is that instances are being reported with increasing regularity of fast-climbing aircraft busting through the top of obscuring cloud, smoke or haze, and having to make violent evasive maneuvers to avoid climbing right into other aircraft maintaining a *legal* "five on top" level altitude.

If we are to avoid the eventual result, it seems reasonable that this ancient standard should be revised along with the 3-mile VFR (in terminal areas particularly) and whereas "on-top" reports should be retained for climbing reports, ATC looks with much distaste on continuing to approve "five-on-top" as an IFR altitude. It has been withdrawn for holding purposes at night and is becom-

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VFR Altitude Regulations and 500 On-Top Under Fire

(Continued from page 37)

ing an equally impractical method when numerous aircraft arrive over a terminal area on top of a low instrument approach condition. For the present, while en route, pilots can safeguard themselves by maintaining a more substantial clearance above cloud decks and requesting an assigned altitude well in advance of arrival over a terminal area.

Current ATC procedures permit a Center to assign an altitude in lieu of "five on top" filed by a pilot, and vice versa. For obvious reasons, the Center usually is the best source of information as to the practicality of operating "five on top" and hence it would appear that a pilot would gain by consulting the Center *before* filing such a flight plan, rather than subsequently receive an unacceptable altitude assignment.

New Subminiature Capacitors Utilize Silicone

Two new lines of subminiature metal-clad capacitators have been announced by GE Company. Both utilize silicone and seals to provide maximum resistance to thermal and physical shocks and permit soldering up to the bushing without damage.

One line of capacitors features a solid dielectric, making possible small size with high insulation resistance and no liquid leakage. The units will withstand extreme temperature ranges. These operate from -55°C to 125°C without derating. Their capacitance varies only 1% between 0°C and 125°C, and only 7% over the entire range. With proper derating, they will function up to 150°C. They can be operated at full voltages up to altitudes seen only by jets. Case sizes vary from .235 inches diameter and 11/16 inches in length to 1 inch diameter and 2⅝ inches length.

The second new line has a liquid dielectric. These operate from -55°C to 85°C without derating and are 20% smaller than comparable oil-filled units. They are as small as subminiature wax units but have superior life.

Both lines can be supplied in either tab or exposed foil designs in ratings from .001 to 1.0 muf in voltages of 100, 200, 400 and 600 volts DC working.

Do Not Blame the Tower!

How many times have you sat at the end of the runway or circled a traffic-controlled airport for long periods while other traffic came and went with maddening ease? Outrageous discrimination of this sort has moved many a pilot to inarticulate rage when the tower persistently ignores all his calls. It happens every day at many airports!

Disregarding the fellow who claims he can prove that the towermen have a commercial arrangement with the airport management to keep out the little guy with the small gas tank as against the multi-engine airliner with the large tanks and therefore turns down the volume on the little guy's frequency, we can usually ascribe the above situation to one of the following:

1. Receiver is tuned to the frequency of a nearby airport other than the desired airport and, if a busy one, you may not hear the tower identification too frequently for obvious reasons. Check the frequency (possible change) and tuning.
2. Your mike button or transmitter relay may be stuck, keeping the transmitter on the air and muting your receiver; nothing can be heard. Click your button and/or change over to an alternate published frequency, or radio equipment.
3. Your transmitter may not be putting out even though you just worked some other facility (remember—other traffic is apparently moving without difficulty!). Again, check your equipment, change to alternate equipment and/or watch for visual signals.
4. You are being blocked out by stronger transmitters in other aircraft. Try an alternate published frequency either one- or two-way channels, and/or cross-channel; transmit low or alternate VHF frequency and listen on the primary VHF channel.
5. If not employing the primary VHF channel, anticipate that other traffic may be completely tieing the tower up on that other and unheard channel and if you are VFR, or not in a critical position, be patient and repeat your call at reasonably spaced intervals.

Definition of ATC Terms

Occasional comments have been received by readers of this column, pointing out that whereas professional pilots are generally wholly familiar with the "languese" used in cross-country IFR airways operations, many other pilots aspiring to professional standards are anxious to be members of the same club. So, for the edification of all and with suitable apologies, we offer:—

Air Traffic—A concentration of numerous aircraft over a given point, each demanding the same route and altitude and each having special priority.

ATC Clearance—A verbal method of compelling a pilot to fly a route and altitude he otherwise would never have chosen.

ATC Controller—An individual (subsidized by the railroads) and consecrated to the task of discouraging travel by air.

Airway—A route so designed by CAA that neither pilot nor ATC can find it on the charts.

Approach Sequence—A means devised by ATC to make a pilot land last when he knows all along that he should be first.

Approach Time—The time given the pilot to make him happy while attempts are made to figure out what to do with him.

Basic VFR Minimums—Those weather conditions under which a chicken can clear a low fence while maintaining satisfactory forward visibility.

CAR 60—An ancient scroll of pre-historic lore, quoted by ATC and pilots alike to prove that the moon is made of green cheese.

Center—Drafty, ill-kept barn-like structure in which government pensioners congregate for dubious reasons.

Competent Authority—Accredited individuals who have finished the third grade.

Control Area—Air space in which only one Center has authority to disrupt the flow of traffic.

Cruising Altitude—Any altitude other than the altitude requested by the pilot—or any altitude maintained by the pilot other than the altitude last approved by ATC.

Departure Time—The time take-off is permitted by the tower after all other aircraft on the field have departed.

Flight Plan—Any information filed by the pilot which Communications can manage to lose or otherwise withhold from ATC.

Holding Pattern—Laughable term applied to the dogfight in progress over the radio facility serving a terminal airport.

IFR—Conditions under which pilots cannot see how closely they just missed colliding—or—conditions under which the other fellow is always flying at your altitude.

Reporting Point—A location over which pilots occasionally verify their position during clear weather. (*Note:* It is considered unsporting to report over such positions within five minutes of estimated time!)

Separation—That condition achieved when two or more aircraft fail to collide. (*Note:* Sometimes achieved by having two conflicting aircraft work ATC on different frequencies—called "Frequency Separation").

Tower—Glass solarium in which the above-mentioned Government pensioners sun themselves.

VFR—That whitish-grey stuff that goes by your wingtips when climbing and descending "in accordance with VFR."

VFR Traffic—Aircraft on collision courses in CAVU.

Circuit Connections

(Continued from page 25)

circuited connections in an extremely crowded junction box.

Another mechanical insurance against loose connections is proper selection and use of certain types of lockwashers. Lockwashers are indispensable in making connections which will remain tight in the face of vibration. There is one point to remember, however, when dealing with plastics and that is the glass-hard surfaces of most of them. Lockwashers of the type having internal teeth as shown in Fig. 1, lack sufficient gripping power to hold against smooth, hard surfaces. But the opposite, externally toothed types tend to "dig in" more effectively, consequently they will hold securely in the face of long periods of severe vibration.

A word of caution in regard to plain and lockwashers of the blued variety: the corrosion-resisting coat of bluing is an effective insulator of electrical current. For that reason they never should be used in direct contact with terminals. Unless plain brass, copper, or steel washers having a metallic corrosion-resisting plating are used in direct contact with terminals, there is no assurance of good, minimum resistance contact between electrical circuits. There may even be a slight "condenser effect" produced if blued washers are used in their place—a condition to be avoided in cases of delicate instrumentation.

If trouble caused by loosened connections was confined only to the operation of the electrical circuits, it would be bad enough, but what is worse, is the sometimes intense heat produced by the resultant high resistance of loose connections. Low-voltage, high-current capacity circuits are capable of generating an enormous amount of heat under adverse conditions, which is often sufficient to ignite adjacent objects or produce alarming smoke and fumes. Not long ago, the writer was shown a boxful of "collector's" items in the form of damaged circuit panels which had, over a period of time, been removed from the various aircraft belonging to one of our largest airlines. Without exception all of the panels, dozens of them, were charred to a depth of an eighth of an inch. In all instances, the terminals had been bolted directly to the panel without the through bolt having been clamped against the panel independently of the nut holding the wire terminal. Incidentally, the cost to the airline of replacing scores of panels and necessarily revising thousands of circuit connections must have represented a considerable loss of time and revenue.

The monetary loss from these particular details is serious, and the potential hazard from such causes is alarming. It might well mean that, because the maintenance personnel were alert to the danger and took steps to correct the deficiencies, lives and equipment were saved from destruction.

The adverse effect of smoke and fumes from phenolic plastic panels charred by the intense heat produced by a loose circuit connection might cause panic among an aircraft's passengers. Cool, efficient cabin attendants have counteracted this in the past, but the more crowded the cabin, the more easily ensuing panic is transmitted from one to another. Smoke and fumes may trigger a condition of mass hysteria. It is obvious, then, that loose connections are not trivial matters.

Another kind of faulty connection and its correction are shown in Fig. 2. The requirement is to pass a circuit through a metal partition in such a manner as to prevent grounding the circuit to the partition from either loosening or improper installation or servicing. Where the metal sheet is comparatively thin and the shoulders of the insulating bushings consequently slight, it is an easy matter to fail in centering the stud in the hole through the partition. Such a hazard is further aggravated in situations wherein a man cannot see or reach behind the partition when working on the side opposite; it takes two working together, with no assurance even then that the connection is made properly.

Built-in Muscles

If a modern fighter plane were not equipped with a hydraulic boost system, the pilot of that fighter would have to exert 5700 pounds of pressure on the control stick to overcome airstream forces at the speed of sound!
Aircraft Industries Assn.

The "fix" shown permits disconnecting leads on either side of the partition without disturbing one or the other and without any danger of loosening the telescoped bushings and through connector.

Connections can be sound from an electrical standpoint and yet be subject to another type of trouble, such as reversal of leads, unless such an event is made impossible by the manner in which equipment is designed. A case in point is one involving rearrangement of electrical circuits in an auto-feathering propeller control system. Because of the efforts being made to perfect propeller-feathering control systems in order to avoid repetition of recent accidents which may have been caused by faulty operation, certain revisions to the control circuitry were made. The principal preventive consisted of isolating single leads to the solenoid from contact with any other circuit. Should this lead become shorted accidentally to a live circuit, the propeller would go into reverse and it would not be controlled so long as the short circuit existed. With all the control leads in a single bundle, the ever-present danger that sometimes a short would occur, could not be ignored with safety. Therefore, the surest means of preventing accidental shorting was to isolate this vital circuit from all others by putting it in a separate conduit.

But in removing one dangerous situation, in this case, another equally dangerous condition of an entirely different nature became apparent through a fortuitous circumstance before any harm could be done.

After the circuit revisions had been made in this particular instance, the propellers were checked just prior to take-off. When a ground check is made, the usual procedure is to see that the propellers begin to feather and then they are returned to their normal operating position. In this instance, however, instead of returning the propellers, the operator inadvertently allowed them to go to full feather. This was a most fortunate deviation from the accepted procedure as it revealed what well might have been a disastrous discrepancy in the propeller-control installation: one of the propellers went into reverse of its own accord when the other reached the full-feather position. This would have been disastrous had the feathering tests been made according to plan, which was to make them at a time when the aircraft's course would have taken it well out over the ocean. The resultant loss of power would inevitably have caused ditching of the aircraft in the open sea and possibly cost the lives of the crew who were unprepared for so unexpected an emergency.

Subsequent examination of the circuit revealed that the single leads to each of the relay boxes had been unintentionally reversed when the connections to them were made. These leads were long enough to permit their cross switching to go unnoticed. The remedy was a simple one: a split block was installed close enough to the relay boxes to permit connections to be made easily and without interference, at the same time prevent any possibility of cross switching of the leads and thereby eliminating an unforseen hazardous situation.

Situations such as the foregoing are not always foreseeable, but every means should be used to predict that which might occur under almost any condition of use. It is a constant challenge to the ingenuity and intelligence of designers to foresee possible trouble and apply the necessary preventative measures beforehand. Otherwise, at some critical stage of operations, a situation will present itself, or what is more likely, a combination of circumstances acting together will result in trouble, perhaps serious trouble.

We cannot rightfully expect design engineers to be wizards in foreseeing all the unfavorable conditions which are likely to influence the operation of the mechanism they design. That would be asking too much. We can expect only that which is reasonably within the scope of their responsibility or ability to perform and we expect, therefore, to get only an average performance. But, on the other hand, every competent designer will look at his design in the light of how it is going to be used. Therefore, the designer must at all times be aware of the everyday problems of the man who uses the equipment and he who must keep it in working order. Furthermore, the designer should accumulate such facts through his own experience or become fully appreciative of them by absorbing the experiences of others. The operators are in the best position to help the designers to do this by keeping them informed of their experiences.

Skyways Round Table

(Continued from page 23)

the operation of any control system, regardless of what you may select, will be a relatively relaxed procedure. Five air-ground communication units per man is a fairly safe, comfortable propostion.

"Now, with 180 channels and putting five on each, it's simple to figure out how many aircraft you can have within a given terminal area at one time without sending anyone's blood pressure up too high. And I think that number would take care of the forecasted traffic density for some time to come."

Jerry Lederer: *"You're assuming positive identification of each airplane?"*

Dave Little: "Yes, and you can get it by radar beacons on the aircraft and/or VHF-ADF on the ground. The limitations of pulse-radar techniques are such that I feel we should not depend entirely on the radar beacon. In every case, the radar beacon should be supplemented by ground VHF-ADF equipment and the companion two-way communication."

Jerry Lederer: *"How would these men on the ground, each one with five aircraft, coordinate with each other?"*

Dave Little: "Through the use of automatic data transfer equipment which has been developed and is in production for CAA."

Jerry Lederer: *"Have you figured out whether or not these five men who run 180 channels would satisfy the traffic around New York?"*

Dave Little: "If we assume maneuvering speeds of 160 to 180 mph, I believe they will."

Jerry Lederer: *"Then all aircraft would have to operate within that range once within a certain radius of New York?"*

Dave Little: "That's right."

Speed Control

John Chamberlain: "That reminds me that I neglected to mention one very important element of the plan I described, and that was the proposal for speed control within that area. One of the original plans has called for aircraft to reduce speed to roughly 180 mph within the outer area, and to 150 or 160 mph in the inner core of that area, as another means of coordinating all traffic."

Jerry Lederer: *"On this VHF-ADF system, what does that require in the way of equipment for small aircraft, such as the Twin-Beech or the Bonanza?"*

Dave Little: "Nothing more than standard two-way VHF communications equipment."

Jerry Lederer: *"Because these airplanes probably would not be equipped with radar beacons?"*

Dave Little: "That's right."

Jerry Lederer: *"I'd like to mention that in the February issue of SKYWAYS, in the Navicom section, there was an article that very strongly suggested that radar beacons, radar responders could not be relied upon to give positive identification in a high-density area because the ground radar apparently holds the airplane captive and the airplane cannot respond to any other radar. In the vicinity of New York, there are so many ground radars that whichever one the airplane responds to first will hold that captive and the other radars will not get it. That could mean that radar on a ferry boat could catch the plane, and radar at Newark, LaGuardia or Idlewild would be unable to get it. Is that right?"*

Dave Little: "Jerry, we're on the fringe of classified information now, but perhaps I could offer this only as personal opinion: I suspect there are so many radars operating continuously in the New York region right now that, theoretically, it is already almost impossible to slide another pulse in with a shoehorn. What you say is, I believe, technically correct, namely that a radar beacon will respond to the strongest captive signal."

Terpsichorean Transports

We can learn from anything. Yes, sir, the airliners are getting rumba tails. They will have lights on the rear end and the lights will wag.

Don't hide your light under a bushel, boy. Wag it!

Hy Sheridan

Jerry Lederer: *"Then VHF-ADF is a must?"*

Dave Little: "I think so."

J. D. Smith *(Capt., Capital Airlines, Chairman, ALPA Regional Safety Committee):* "To clarify this matter of speed control within the area, I assume speed control runs up to 3,000 ft. and that everything above 3,000 ft., speed-wise, would not be under restrictions. Is that right?"

Jerry Lederer: *"Yes."*

J. D. Smith: "Well, what would prevent a LaGuardia-bound pilot from coming in and maintaining 3500 ft. until he was over Maspeth, then diving her down to come around and land? The point I'm trying to raise is, do you think that kind of an operation would help the problem around the terminal?"

Dave Little: "As I remember our discussion and agreement on this speed-control factor at the ATA chief pilots meeting a year ago in St. Louis, we agreed that speed control would apply to *any* altitude. It would be a function of radius from the terminal. It was envisioned, for example, in approaching New York, that when you get within a 50-mile radius of the Empire State Building, you would slow down to 180 mph. At that meeting the total industry agreed to accept this principle for safety sake. I know it hasn't been applied to date, and how soon we may put it into effect is a good question."

John Groves *(Eastern Regional Opr. Mgr., ATA):* "I was at that meeting, Dave, when that matter came up. I think the difficulty we had with that sort of an arrangement was the fact that there were a lot of people who felt that it would be unreasonably restrictive to certain types of traffic, and I agree with them. The second problem was that you somehow had to take care of your over-traffic, and the only way you could do it would be to take it around the area. That isn't a bad idea if you have the facilities to do it. I understand there's to be more discussion on that subject at the chief pilots meeting in Chicago. Personally, I don't think we're going to come up with any uniform agreement on it. I don't think speed control is the answer."

Jerry Lederer: *"I'd like to bring up another point on this speed-control matter. There is a regime where, in turbulent air, you have to operate for safety. If you fall below this speed, you might stall; and if you go above it, you might tear off a wing. Do the designers know the airlines' thinking in this connection, so that they will design the airplane to operate within this range with safety?"*

Dave Little: "I believe the turbulent air speed specification of all current transport aircraft is within the range we agreed to."

Jerry Lederer: *"Will the new jets be that way?"*

Dave Little: "So far as I now know, yes."

Bill Moss *(Capt., Pan American Airways):* "Of course, Boeing Aircraft represent a smaller segment of the air-transport field, but the speeds talked about are getting pretty marginal on the low side for the B-377. Your 180-mph works out to be roughly 160 knots, and that's lower than we like to go with our flaps up, and is considerably lower than our turbulent airspeed, as Jerry mentioned. However, I agree with Mr. Little that the jets will probably be able to safely maneuver in the mentioned speed range because it appears to me that the trend of thought on jet specifications, both pilots' and operators', calls for stalling speeds, and hence safe maneuvering speeds, lower than those of the B-377, or even the DC-7. This is because of the landing distance problem peculiar to the jet, and also because of the recent recognition of the instrument approach problem which Mr. Jenks, in his IAS paper, so aptly named 'the ballistic tendency' of high-speed aircraft *(April SKYWAYS, Navicom Section)*. Whether or not such low-speed maneuvering by a jet would be excessively uneconomical is another matter, however, but since we're talking safety here, I won't go into that."

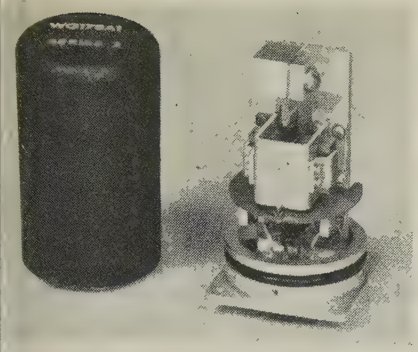
Dave Little: "Granted, it was a compromise, but between the DC-3 on the one side and the 377 on the other, it was the best we could arrive at."

J. D. Smith: "Setting up this speed of 160 to 180 mph, it appears that we're trying to separate commercial aircraft from commercial aircraft. From a pilot's viewpoint, however, we view *any* airplane as a potential mid-air collision problem. What arrangement would this speed-control system provide to insure that we would be reducing that mid-air collision problem with smaller aircraft?"

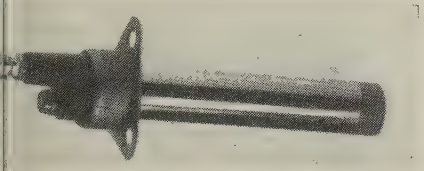
John Chamberlain: "I don't think there is any positive assurance that it will make dras-

(Continued on page 42)

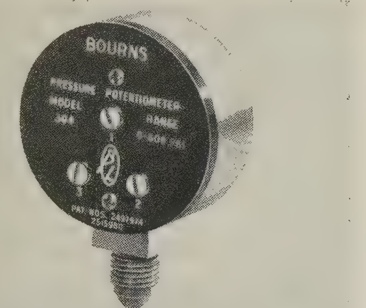
SKYWAYS reports NEW PRODUCTS

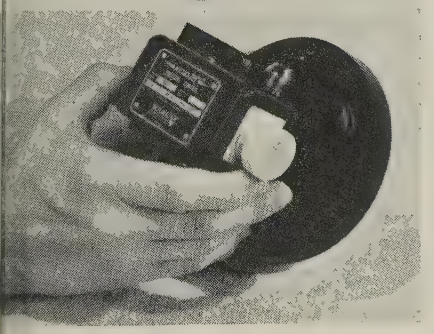


New 400-cycle synchronous vibrator converts D.C. signals to A.C. for aircraft control purposes; comes in 115 & 12.6 models. Minneapolis-Honeywell.

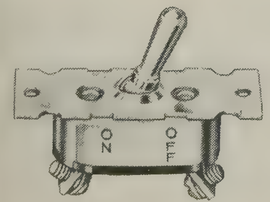


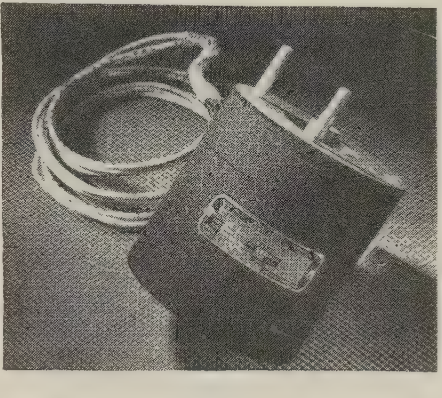
"Thermoswitch" fire and overheat detector with GE mycalex bushing molded around terminal wire inserts to give hermetic seal. General Electric Co.



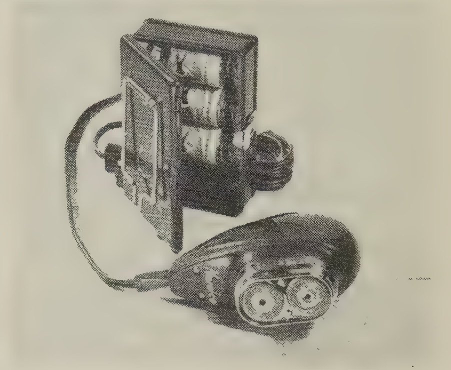


Bomber-type aircraft toggle switch manufactured to meet MIL-S-6745 specifications & AN3022; two or three position. Arrow-Hart & Hegeman Co.





▲ **C** A.C. generator for aircraft, missiles weighs 4¾ lbs; 800 watts, 115/200 volts, three phase, 400 cycles; no brushes. AiResearch Manufacturing.



▲ **D** Portable electric shaver operates on flashlight batteries or 6-volt auto battery; comes in pigskin case. Retails: $29.95. North American Philips Co.

◀ **E** Miniature gauge pressure potentiometer designed for remote measurement of hydraulic, pneumatic pressure in aircraft. Bourns Laboratories.

Splicing tape for electrical use is extra thin with high tensile strength, adhesive qualities; meets UL, ASTM standards. Woven Hose & Rubber Co. ▶ **F**

◀ **G** Solar Microjet directly senses engine pressures; replaces complicated electronic equipment on jet engines; is small, lightweight. Solar Aircraft Co.

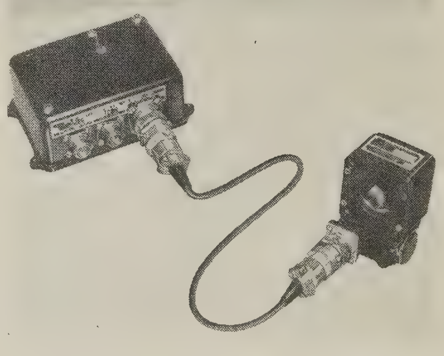


Photo-electric sensing system detects presence or absence of liquid in hose, tube or pipe, flashes message to cockpit; operates 0-200 psi. Whittaker Co. ▶ **H**

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Skyways Round Table

(Continued from page 40)

tic reductions in this possibility. It is generally considered that, as we are increasing speed in later types of aircraft, it will help considerably if we whittle down the high-speed end and keep all aircraft within reasonable speeds, control-wise. This problem of control and the avoidance of collision is actually a function of time, and if all aircraft are not going faster than a certain speed, it will give us at least a certain amount of time to work with. I don't think any thought has been given to trying to force up the speed of light aircraft operating in the vicinity, certainly not to the extent that it might require them to operate at full throttle to keep pace with transport-type aircraft. But we do feel that there is a definite advantage in keeping them all below a certain maximum speed."

Jerry Lederer: *"When you gave your talk in Oklahoma, John, I believe I pointed out that there are a lot of collisions below this lower lid of 1500 ft. that you brought out. Do you have any figures on that?"*

John Chamberlain: "I don't believe so, although I think of the 15 collisions I mentioned, about eight of them occurred near an airport and, as I recall, a majority of those were above 1500 ft."

Jerry Lederer: *"Have you considered this procedure from the point of view of avoiding the noise trouble? After aircraft enter the periphery of this cylinder, you've got to direct them in such a way as to avoid populated areas because of the noise. Is that being considered as part of the whole program?"*

John Chamberlain: "Yes, it is, although the noise problem is one which cannot be treated very satisfactorily by government regulations applicable to all types of operations. I think the noise problem is one calling for local solution or local handling between CAA and the local operating people."

Edward C. Marsh *(Chief, Aviation Safety Div. Reg. 1, CAA)*: "I agree with John that this noise problem has to be considered locally. I heard the opinion expressed earlier that what we are doing now is in the nature of a temporary solution to the noise problem, but that the permanent solution is one of engineering origin. I hope that is true, but I honestly don't expect to live to see it. I feel that this noise thing will be with us for the rest of our tenure in aviation. Even though substantial improvements are made in the airplanes to cut down noise levels, a noise problem exists when the people who live around an airport *think* they have a nuisance. The degree of nuisance that is actually existent varies widely, but the problem does not. In other words, we know that in some places people are subject to some pretty horrible noise. These people are not any more or any less vocal than large areas of people who, we feel, are really not subjected to anything they should complain about. You have a problem when the local people *think* they have trouble; and what it takes to make a group of people think they have a noise nuisance is very different in different locations. For that reason, I think noise is going to be an industry problem.

"In connection with the collision hazard in the terminal areas, I'd like to say that there may be some help through separating out the traffic under relatively good weather conditions. Most of the incidents or near-misses in this area have involved a relatively fast or a relatively large airplane and a very small and usually slow airplane. I don't recall any cases recently of two fast airplanes or two small, slow airplanes being involved. It seems to me that it might be entirely practical, at least under VFR conditions, to separate that traffic by a general rule-of-the-road that at least 10 miles from the airport, or perhaps even outside the airport control zone, the large heavier airplanes will maintain altitudes of 3,000 or 4,000 ft., and that the small aircraft will keep under that.

"It seems to me we have our biggest trouble today outside the control zone."

Jerry Lederer: *"Do you have any comments on that, Mr. Woolf?"*

Bill Woolf *(Chief, Airport Traffic Controller, Newark Tower)*: "Relative to possible collisions, I think one of our biggest problems is frequencies. There are too many aircraft coming into this area that are not equipped with all frequencies. Let's take Newark for an example. There is no published low-frequency let-down on the range due to the proximity to the Elizabeth, N.J., courthouse, and it's hard to work out a control problem when you find a fellow coming into our area with nothing but low-frequency equipment. All you can do is suggest that take a radar approach or go somewhere els

Jerry Lederer: *"Are you talking about VF or IFR?"*

Bill Woolf: "I'm speaking of IFR. I belie that all aircraft should have a minim amount of equipment before they enter dense traffic area under IFR conditions."

Fred M. Glass *(Director of Aviation, P of New York Authority)*: "What do y think the 'minimum type of equipme should be in the New York area?"

Bill Woolf: "I can't speak for the wh New York area, but as far as Newark is co cerned, they should have either ILS equ ment or be able to make an ADF approac

6th Annual International Aviation Exposition

The theme of the Aero Club of Michigan's 6th Annual International Aviation Exposition, to be held at Detroit-Wayne Airport July 9-10-11-12, is "50 Years of Aviation Progress." The first two days of the show will be devoted to the trade, with a special program prepared to appeal to key people in the technical phases of aviation. During these two days, the field will be open for demonstrations of all types of aeronautical equipment. The second two days have been programmed to appeal to the public. The military services will stage static and flight demonstrations; commercial air carriers plan displays and demonstrations; and a special exhibit of business and industrial aircraft is planned. Youth activities will include model making and flying, and a contest for aircraft design for aero-engineering students in Michigan colleges.

Pilot Competency

J. D. Smith: "I'd like to go back to yo opening statement, Jerry. I was surprised note that in your comments on the proble and how to overcome them, you didn't re to a pilot's competence, Mr. Chamberla did to some extent, but I was wondering i could get a comment from someone as whether or not pilot's competence is a fac in the problem.

"In bringing that up, I have in mind aircraft that left Greater Pittsburgh Airp enroute to Allegheny Airport, a distance 18 miles. That plane was being operated a taxi service. It took the pilot 3½ hours make the flight. And in that time, many tri were either cancelled or planes had to be routed to proceed to alternates because that one particular plane. I think that pilo competence is a part of the problem."

Jerry Lederer: *"There's no question ab it. One disconcerting factor in this matter pilot's competence is a fact brought out the Cornell study I mentioned earlier. T study indicated that the variation betwe the techniques used by airline pilots is great as the variation between techniqu used by the airline and the non-airline pilo But there is no question that there should certain minimum requirements so that pil can use the ADF or the ILS."*

Bill Woolf: "Are you speaking of the vari tion from the standpoint of abilities or tec niques?"

Jerry Lederer: *"Techniques."*

John Groves: "That's one of the things th we of the airlines have felt very strong about. It's what we call the dual standard f instrument competency and also the du standard for airborne equipment. Naturall we feel the standards between airline r quirements and non-airline requiremen should be closer. There shouldn't be tw standards—a man should be qualified and should have the equipment in his airplane fly on instruments.

"Aside from the hazard of lost aircraft a the hazard of someone popping up over t end of the runway all of a sudden and sa ing, 'I'm VFR,' before anyone knew he w there, we haven't had too much trouble. B it's going to come and it's something have to face in these high-density areas— must set up a standard of competency;

st have a standard of aircraft equipment. the airline standards are too high, let's p them down; or if the non-airline stands are too low, let's bring them up.

One more thing—let's not ever put anyng in the regulations requiring noise con- traffic patterns. Let's keep that on an ividual basis at individual locations."

ohn Chamberlain: "With respect to the ot's competency to operate IFR, we've n studying that whole problem for the t year to see whether or not we have a d for two different types of privileges. I 't want to indicate whether it should be instrument ratings, or one rating with erent privileges. That's immaterial at the ment, but there is quite a wide range been full IFR, that is, actually flying on truments in the fog, and what may be a hnical instrument condition. There are of non-airline pilots who probably should able to get up and down through a thin k, and go more safely to their destinan on top of either a solid or a broken lay- but who never should make a full-fledged trument approach to any kind of an air-t, much less a busy terminal airport. We ve, therefore, felt that there is a need for e differentiation between the two types privileges. It's very difficult, however, to ine those two, and I'm not suggesting that her the present instrument rating requirents are what they should be for the high- privileges, or that the airline requirents are exactly right.

There's a lot of room for rationalization clarification of that whole picture, and may help the terminal control problem e of these days."

erry Lederer: *"I'd like to go a step further this. What about the maintenance of the uipment aboard these aircraft? I think it s found in an investigation of a collision tween an airliner and a small aircraft that small airplane had had the equipment t it hadn't been maintained and so it didn't erate. Isn't that right?"*

John Chamberlain: "That's correct. In the ident you're referring to you could defiely say that satisfactory communication th the Tower was not established by the all aircraft."

Jerry Lederer: *"Therefore, in addition to e competence of the pilot, there should be me assurance that the equipment is operatg before a pilot enters this particular conl zone."*

J. D. Smith: "Mr. Chamberlain, do you feel at communication ability should be a govning factor in determining what type of flyg a pilot should be able to do? We've run to situations where, because of a pilot's unmiliarity with routes, airways routings or parture procedures, a frequency has been d up and, during that period, everything mains at a standstill. I feel that on instruent check rides emphasis should be placed pilot's ability in communications."

John Chamberlain: "I definitely think more tention should be paid to that phase of it."

Jerry Lederer: *"We've been talking from the oint of view of the airline operation. Is there anyone who'd like to take the part of the private pilot?"*

J. D. Smith: "On this communications question, it was the non-airline operator I was referring to."

Edward C. Marsh: "I don't think the private pilot needs any defense. The basic things we're faced with in providing safety in these terminal areas are generally heartily endorsed by the private flying organizations. The only catch is that the equipment that seems to be indicated is expensive, not only to buy but also to maintain.

"I feel a good bit could be done by separating out the traffic. Doing it that way has the virtue of not requiring a lot of expensive equipment and expensive know-how on the part of the private pilot. That's why I feel that separating traffic may be our first step. It may not solve the problem immediately adjacent to the airport, but it can help in areas 30 or 40 miles from LaGuardia, out on Long Island or in Connecticut, for example, beyond the control zones involved. There's a lot of traffic in the air in these areas on any good day, and it's there that we have trouble. I think it's entirely feasible to separate traffic in such areas."

Jerry Lederer: *"In separating traffic under VFR conditions, you mean to require small planes to fly no higher than 4,000 ft.?"*

Edward C. Marsh: "Yes, but I dislike the connotation of the word 'require.' I would like to see it worked out as a cooperative thing, somewhat like the noise agreement in this area. I believe it would be far more effective if it were widely publicized and agreed to by all elements of the industry, without any enforcement tied to it."

Jerry Lederer: *"Before we go any further, I'd like to ask if anyone has ever defined or tried to define what is meant by a 'marginal' weather condition. That word 'marginal' has always bothered me."*

D. M. Little *(Asst. Chief, Weather Bureau, Washington)*: "Marginal weather is the weather when the ceiling is down to 200 or 300 ft., or possibly 500 ft., and the visibility is less than 3 miles.

"Perhaps I should mention the work the Weather Bureau is doing out at MacArthur Airport on Long Island and the work Sperry Gyroscope Company is going to be doing for the next 18 months.

"The Air Navigation Development Board was anxious to find out if the end of the ILS runway could be instrumented so that better weather information could be given to pilots coming in on the ILS system, and also to find out whether measurements of weather conditions from this point would agree with what the pilot sees as he comes in to land. The ANDB gave the Sperry Company a contract which runs for 18 months and which provides for about 1,000 landings with a fully instrumented DC-3 under low-ceiling and low-visibility conditions. The design of the experiment is such that results will be applicable to all airports, to the various types of weather situations and to all types of aircraft.

"The Weather Bureau installed two rotating beam ceilometers, one 1800 ft. from the end of the ILS runway, and the other 3500 ft. from the end of the ILS runway, which measure ceilings down to less than 50 ft. Visibility is measured by recording transmitters and we also have the standard black square visibility markers for eye observation. In addition there is an observer who climbs up onto a 15-foot stepladder at the end of the ILS runway, to look down the runway and take an observation of what he sees at the time the pilot in the DC-3 is coming over the middle marker. Then, of course, he has to climb down and get away before the airplane comes in for the landing. Photometers are installed to measure the contrast brightness between the runway and the ground, and illuminameters are provided for measuring the sky brightness. The transmissometers measure the visibility over a given 750-foot path at an altitude of 15 ft. This altitude is supposed to be the height of the pilot's eyes at touchdown, although we realize it won't be in all types of aircraft.

"Sperry hopes to make over a thousand flights during the next 18 months at MacArthur in all kinds of weather, evaluate the data, and prepare reports on their findings. From all this we hope to be able to determine what kind of weather instrumentation should be installed at the ends of runways that will be reliable and automatic so that the information will be meaningful to the pilot and can be transmitted continuously from the end of the runway to the control tower or GCA operator and weather office."

Approach and Landing

Jerry Lederer: *"Now we should get into another phase of this problem, the approach and landing. Capt. Jenks, that's your field."*

Arthur E. Jenks *(Chief, Flight Inspection Div., CAA)*: "Before we get into approach and landing, Jerry, I'd like to sum up some

(Continued on page 44)

AF AERO FACTS

Friction caused by air against the surfaces of a jet interceptor at near sonic speeds raises cockpit temperatures as much as 80° above the outside air. To prevent a pilot from roasting, the AF installs air conditioning units which have cooling effect of 20 family iceboxes.

•

During World War II, aircraft radio receivers had from six to 20 channels. Today the AF is buying from aircraft component manufacturers receivers which have more than 1,000 channels.

•

In the near infinite complexity of modern aircraft, the high-precision gyroscope alone contains more than 3,000 parts. By way of comparison, a wristwatch contains only 127 parts.

Air Materiel Cmd.

Skyways Round Table

(Continued from page 43)

of the discussion we've had thus far.

"We've talked a lot about radar control and speed control. To me, speed control is sort of an idealistic thing—it cannot be achieved, operationally, except within certain limits. For example, if a DC-3, a DC-4 and a DC-6 all report over Flatbush at the same time, they're all going to have different ETA's at LaGuardia. The Tower controller knows all that and gives them their landing sequence accordingly. To segregate any such problem like that, under IFR, complicates the situation. We have a lot of different nationalities getting into the traffic control problem now, and they all come up with the orbit idea and a final track. To me, our only solution to traffic control in a terminal area is some sort of an orbit path and final resolution to the landing path in that manner. When orbiting can be accomplished with precision, you have automatically taken care of your speed problem because the faster airplane takes the largest orbit. It makes no difference to him as to time.

"I'm just hitting the high spots of the problem, but I believe that's what we'll come to eventually.

"Going to the problem of the legal certification of all the various types of pilots that are going to fly this type of operation, we have everything today from the airline captain who has to cut it right down to the bottom IFR minimums, to the businessman who flies his own airplane and wants an instrument ticket so that weather slightly below VFR minimums won't keep him from an important conference.

"In addition to that, we've got to take another look at our VFR minimums because the 3-mile limitation, as applied and currently in the regulations, no longer holds any water when you consider two 300-mph airplanes approaching each other in that type of visibility. You have to reckon visibility in terms of time, and with jet operations and approach speeds in the 300- and 400-mph category, you can see how little time you have to work with.

"Getting down to the final approach problem, you have that problem through a variety of conditions, from marginal IFR down to the lower end of the scale which is the very bottom of feasible operations. A typical tough situation is where you have a smoke condition in a terminal area, with a 2,000-foot top, CAVU above, but a mile or less visibility in the stuff and a bright sun on top, with the wind that makes approaches up-sun. That's your worst condition because the pilot probably has the equivalent of 2 miles visibility on the downwind leg, then turns into the wind and comes up-sun with visibility less than half a mile.

"Terminal areas should be controlled with a precise system of radio navigation throughout if you're going to combat all these various things.

"The next thing is the approach problem itself. We have to insure the pilot on the approach, enough time to perform his initial track tie-down or heading stabilization to acquire the accuracy necessary, and the necessary instrumentation to hold that alignment and assure it the rest of the way in. Once the final alignment has been achieved, there is no great difficulty."

Tempest Techniques

The cunning Connie had just come through a line of naughty thunderstorms and it had done so with hardly a jolt. As the captain walked down the aisle to get off to sign a clearance and to out-maneuver the mechanics on the gasoline, a passenger looked up and said gratefully, "I sure thought we were in for it, but you got us through mighty smooth. Was it technique . . . or luck?"

"Luck," replied the captain. "I always use luck . . . it's more dependable."

■

The Civil Aeronautics Administration has just announced that when the DME (stunted for "Distance Measuring Equipment" to be used with the omnis) is available they will give us curved airways. That's nice. If they can't adjust me to the airways, they'll adjust the airways to me.

Hy Sheridan

Jerry Lederer: "*Do you expect jet transports to orbit?*"

Arthur E. Jenks: "I believe the orbiting idea is the most sound of any of the present equipments we have for this type of navigation. From fix-to-fix in straight-line tracks becomes nearly unworkable, particularly when you consider the traffic density five or 10 years from now."

Equipment Needed

Dave Little: "A remark was made indicating that holding in the terminal area is a major problem. It is my belief that our currently available runway capacity exceeds our terminal loading-area capacity where adequate two-way direct ATC communication and radar traffic control are available. Putting it another way, if all aircraft involved have sufficient two-way direct communication with the several air traffic control organizations, and they have adequate radar, it is theoretically impossible for any stack to exist in the terminal area."

Fred M. Glass: "Dave, is that problem primarily one of technique or equipment?"

Dave Little: "It's purely economic—getting the equipment on the planes and providing the ground radar and communication."

John Groves: "Does that mean you have put that equipment on all aircraft?"

Dave Little: "Yes, all aircraft. Any one a craft without it would upset the whole thin

J. D. Smith: "On this equipment busine Dave, I agree with you 100%. But let's j review what we have at a terminal where have pretty good radar coverage. There's doubt that with radar we're improving in-bounds tremendously. We're getting th in faster, but we're getting them out tw as slow as we did before radar. We're, the fore, sacrificing something to improve the bounds. There's no delay at all in coming but after we gas up and load the passenge we sit out on the runway for about 30 m utes. The question is, are we solving the uation by improving the in-bounds?"

Dave Little: "Traffic control developm has caught up with and probably passed a port construction. It's my opinion that also have a problem in airport constructio we need more taxiways, more end-of-runw run-up areas, gate space, servicing faciliti etc., in order to move more in and out of airport with profit."

Fred M. Glass: "Dave, I'd like you to el orate on what you have in mind. You m tioned 'lack of gate space'."

Dave Little: "Let's take LaGuardia as example. I have no figures on this, but j from going in and coming out of LaGuar it's my opinion that we can put more planes on and get more aircraft off of single runway being used than can be h dled in the terminal area."

John Groves: "There's doubt in that, Da Let's say you want an IFR clearance to B ton. You may be Number 3 out there on taxi-strip, but you can't get by the other that are waiting ahead of you. Therefo you can't get your flight going to Bost even though you've got a hole there that take care of you. In the meantime, Pittsbu and Washington are plugged up; the airc ahead of you can't move, so you're finish You don't make use of the runway or airspace."

Dave Little: "That's what I mean by minal construction being slightly behind traffic development at the moment."

Fred M. Glass: "You're undoubtedly ri Dave, as far as LaGuardia is concerne would like to point out, however, particula in view of your discussion of the econom of equipment and the airplane, that ther also the matter of the economics of airpo It is precisely the same problem."

Differences in Minimums

Herbert O. Fisher *(Chief, Aviation Deve ment Dir., Port of N.Y. Authority)*: "Thi somewhat off the subject being discussed the moment, but it has to do with pilot ficiency and air-terminal safety. The sch uled carriers are operating under IFR we er minimums and standards that are, in m cases, higher than for other aircraft. The lines' minimum weather take-off is 200 ¼ mile. As airport operators, we obs under almost all instrument conditions

e and other aircraft proceeding out, an airway clearance, to the end of the ay and taking off under almost zero-zero itions. Quite recently we had departures terboro and LaGuardia when the weath- as much less than 200 and ¼. The air- were not operating, but other aircraft I would like some opinions on what hink of the differences in minimums for two types of operations. Do you con- this a safe operation?"

hn Groves: "I think it should be same everybody. If an airliner can't take off take-off minimums are less than the landing minimums for getting back into field in case of an engine failure, it ld be the same way for other aircraft."

D. Smith: "A pilot could take off at ark with just a range receiver and zero- and how could he get back in? Even if ad 100 ft., he wouldn't have the equip- to get back into the airport."

rry Lederer: *"If he knows that, and it's his own neck he's exposing. . . ."*

hn Chamberlain: "There is some degree ird party risk in any flight. We certainly be careful in regulations, however, and carry them too far or we'll rule out sin- ngine airplanes.

f I recall the regulation correctly, there restriction with respect to take-off mini- ns for non-air-carriers. They do, however, to comply with the prescribed landing mums. Now that wasn't so until two or e years ago. There were no specific mini- s for non-air-carrier aircraft at all. The al regime was the landing and these mums have been applied. There's ob- sly some problem in the take-off situa- But it's generally considered less than nding, and that's one of the many facets g considered now in connection with this le study of the flight-control problem."

ed M. Glass: "What you say is true from historical standpoint, but I would like to ire as to whether you consider the ab- e of take-off limits with respect to non- arrier aircraft to be a sound regulatory cy, or is the establishment of such mini- under consideration by the CAB?"

hn Chamberlain: "You can't make sound lations unless you consider the history. can't at any moment in history suddenly e our latest concepts of proper regula- s on the entire industry. If we did, we'd bably put everything on the ground. We ld put it on an historical basis and pro- to plug up the holes as we see them, ome kind of an orderly fashion."

ed M. Glass: "The question Herb brought is related to a personal observation made ntly at LaGuardia. On this occasion, visi- ty was practically zero—in fact it was so ted that when standing in the Tower, you ld barely make out the ground area be- en the ramp and Runway 13-31. None the airlines were taking off. Yet, there a procession of corporate and military raft taking off in a steady stream. I was ised by the Tower that it was the policy the CAA to leave such take-offs to the

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Skyways Round Table

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discretion of the pilot.

"Is that policy of the CAA under further consideration, or do you consider such to be a sound operating policy?"

John Chamberlain: "It is under consideration. However, the problem we face as a regulatory agency is this: you may have one situation which would dictate one type of policy, taking off under these conditions from LaGuardia, for example; and you might have a totally different problem under the same circumstances, taking off at Winslow, Arizona. The Board's regulations are those which appear reasonable from the standpoint of broad applicability all over the country."

Fred M. Glass: "But if the CAA can establish one minimum for TWA, for example, at Winslow, Arizona, and another minimum for TWA at LaGuardia, couldn't a basic minimum for non-airline aircraft be established for LaGuardia and another minimum for Winslow, these minimums being whatever you consider proper in the light of the physical and other factors involved at the particular field?"

John Chamberlain: "Perhaps we could, but I don't think you can divide it in just two categories. A large transport-type aircraft flown by a pilot with an airline rating for an oil company shouldn't be treated the same as I would be, flying a *Bonanza.* The problem isn't so simple that we can slice it into two parts: air carrier and non-air-carrier. But it is something that's being given attention along with a myriad of other such problems in this whole picture of traffic rules, in order to see what we can logically put in Part 60, which contains the general rules applicable right across the board."

John Groves: "If, as an airline aircraft, I can't take off unless I've got landing minimums to get back in again, I don't see why it should be any different for any other plane."

John Chamberlain: "I think you come right down to the difference between an airplane with a bunch of fare-paying passengers and operating as a public service, and aircraft not carrying paying passengers or operating as a public service."

Jerry Lederer: "*We're now getting into the philosophy of regulations, and we can't discuss that today. But I might point out that if you follow this to a logical conclusion, you'd have no crop dusting, for example. You wouldn't have learned to fly and neither would anyone else if you didn't agree that the main philosophy here is to protect the public and not the man against his own deeds.*"

Fred M. Glass: "I agree, but we are much more concerned with the 'dusting of populated areas' than we are about crop dusting."

J. D. Smith: "That's the point I want to make. If the airlines are not flying, what all of a sudden makes it safe for a corporate pilot to take off with the weather socked in?"

John Chamberlain: "We can't write regulations in Part 60, and I hope we never start to, which have a separate page for LaGuardia, another for Idlewild, and another for Winslow just because you have a bigger problem at LaGuardia than you do at Winslow. That is the type of problem we can best work out with CAA as a local procedural matter."

Arthur E. Jenks: "I'd like to add another thought before we leave this. In watching this picture grow through the postwar years, I can't help but feel that one of the reasons why so-called private flying is in the doldrums today is because of the lack of continuity or ability to operate in a reasonable amount of weather. And that's largely due to the type of equipment they've had available. But in the next few years that situation is going to be remedied, and if you think the transport industry has a problem in instrument traffic now, you wait until then . . . the day when a 400- 500-mph twin-jet private transport hits the market, a plane that's comparable in price to the *Navion*, for example, and one that can be flown in a reasonable amount of weather. When that day arrives, you're going to have to contend with that operation IFR, and that's going to be serious. It's going to take a tremendous educational program to acquaint these people with the full aspects of IFR operation."

Do You Remember . . . .

Way back when tractors first came in and most of us birdmen deplored the idea, saying that the airplane would be flying in a built-in headwind?

And do you Johnny-come-latelies know that the first tractors were airplanes and that the word, "tractor" was applied to cleated prime movers by some bediddled advertising man?

Yes, sir, the first tractors were airplanes!

Jerry Lederer: "*Right now there are owners of single-engine private airplanes without any instrument training whatsoever, who are putting automatic pilots in their aircraft and flying under instrument conditions. They are depending entirely on the automatic pilots. There is no way you can catch those fellows, and they are a definite hazard to the airlines and to anyone else in flight. That's just a prelude to what Capt. Jenks is talking about.*"

John Grove: "Do you mean that people fly IFR without a clearance?"

Jerry Lederer: "*Without clearance and without any instrument rating. If a radio tube failed, they'd be out of luck.*"

Arthur E. Jenks: "In the study and the work that we've done in the last year, I think we can safely foresee operations under actual visibilities down to 1,000 ft., and for every hundred feet you go below a half-mile, it b comes critical. Now if we keep building ai planes bigger and less maneuverable, we have to back up from these figures. It w become a question of time, the vital numb of seconds that visibility is available betwe breaking contact and the ability of your ai craft to respond to its controls. We mu recognize the ballistic effect of a high win loaded, heavy airplane coming in at 200 250 feet per second. Even if you want to co rect 75 or 100 ft. of misalignment, that b airplane will travel from 1700 to 1900 ft. those speeds before the correction can b noticed as a change of track. Those are th things that must be considered either in th form of rate instrumentation or in raising th minimums, acquiring the necessary visibili in terms of time."

Jerry Lederer: "*What do you mean by ra instrumentation?*"

Arthur E. Jenks: "By rate instrumentation mean that it is possible to maneuver the bi gest airplane we have in service today, pr vided you can see what you're doing with If you have to do that on instruments a are only going by the amount of displac ment, you'll wind up doing an S turn a you won't hit the runway. Essentially, th is rate instrumentation: it's providing the IF information to the pilot so that he can s what he is doing under those conditions, other words, the pilot can see the rate of cl ure or the rate of correction he is applying

Herbert O. Fisher: "Before we close th session, I'd like to go on record here on th matter of take-off minimums. It was only t wisdom of executing almost zero-zero tak offs at our metropolitan airports that I w questioning. When it comes to IFR pilot pr ficiency, many of our company or busine pilots are as well qualified as any pilots f ing scheduled airlines. There are also ma pilots who hold instrument ratings, but a not proficient enough to execute a 100 safe operation diving IFR conditions in th heavily congested metropolitan area. It common knowledge that some of the co porate owners' aircraft instrumentati equipment is as good, if not better, than th aboard some air-carrier planes. Taking factors into consideration, is it sound ope tional procedure to take-off under such duced weather conditions? As airport op ators, we have a definite obligation to o surrounding communition to consider a protect, in event any operation appears to marginal as far as safety is concerned."

Summary

Jerry Lederer: "*Gentlemen, we must n close this session and I'd like to summar the discussion this way:*

1. The most critical regime of flight is the terminal area.

2. In the past 10 years eight of the 15 m air collisions involving air-carrier aircr have occurred near airports.

3. A survey on near-misses in an 11 mon period during 1949 showed 292 reported ne misses. However, the actual number is pro ably much greater. About 44% of th

ir-misses occurred under IFR or marginal R conditions. A Cornell report indicates t civil air-traffic movements should double 1965.

4. Important problems to be faced include: hat minimum equipment should be in the plane, in the control towers? What conls should be placed on the aircraft optor to secure safe and orderly entry into controlled area?

5. An important difficulty results from the xture of controlled and uncontrolled traf particularly in marginal weather.

6. All traffic in high-density areas should controlled to eliminate border-line weather zards but this is difficult to accomplish beuse of the current impracticability of intaining adequate communications with aircraft in the area.

7. Too many aircraft operate in highnsity areas without sufficient communican frequencies. Many private aircraft have ly low frequency radio equipment. ILS uipment and ability to make an ILS appach is recommended.

8. Pilots should be competent to cope with hniques required in high-density areas; craft equipment should be adequate and iable. The equipment of many executivepe aircraft is equal to and sometimes suvior to airline equipment; many executive lots are as well qualified as airline pilots.

9. Human vision is not a reliable solution the collision hazard because of increasing eeds. Traffic operations will have to dend on air-ground communications, radar l VHF-ADF.

10. Present VFR limits are not realistic th faster aircraft; "legal" VFR visibility nimums should be a function of time her than distance; the influence of a ght setting sun is of importance; visibility a downwind leg of an approach may be miles; on the upwind up-sun leg, 1/2 mile.

11. A ground controller can seldom handle re than five aircraft by direct communican. About 180 radio channels are now availle; putting five controllers on each would ovide for adequate control for some time come. Automatic data transfer equipment uld provide the necessary control centerproach control-control tower coordination.

12. VHF-ADF plus surveillance radar can ovide positive identification for aircraft.

13. Speed limitations (150 to 180 mph) a controlled area is very desirable but may t be practical of achievement.

14. For a distance of about 30 miles bend the control zone traffic congestion could alleviated by voluntary altitude operations the faster aircraft operating above, say 00 feet, and the slower ones below.

15. Noise problems vary with local condins; call for local solutions. The permanent lution to the noise problem is an engineerg problem (with doubtful outlook).

16. The Weather Bureau in contract with erry is evaluating visibility and ceiling retionships to determine what type of instruentation to put at the end of the runways to tomatically provide realistic and reliable sibility and ceiling information which can be relayed to the pilot. We hope it will become useful advisory information, not a legal control of aircraft operations.

17. "Orbiting" through the use of DME should be considered as a practical solution to traffic operations in high-density areas. Heavier and faster aircraft would naturally assume an orbiting path of greater radius than smaller, slower aircraft.

18. Stacking and delays in take-off could be reduced by more adequate taxiways, runup aprons and ground-servicing facilities on the airports. Terminal construction lags the capacity of runways and the development of traffic control.

19. Operating limits (visibility, ceiling) for non-air-carriers should be the same as for air carriers where accidents may jeopardize the safety of the residents living in the vicinity of the airport.

20. Heavy aircraft with high wing-loadings may require greater visibility because of ballistic effect of an aircraft travelling at 200-250 feet per second. Such an airplane will travel 1700 to 1900 feet before responding to controls such as might be required to correct for alignment of 100 feet with the runway. Rate instrumentation (rate at which aircraft responds to forces) or greater visibility minimums may be necessary for safety for these aircraft.

With our discussion summarized, I'd like to join with you, gentlemen, in thanking Skyways for providing us this very useful activity.

Landing Speed Indicator

(Continued from page 12)

ever know as much about the lift of his aircraft as the LSI. If the LSI is the seat of the pants, it is a seat of the pants with all the advantages of higher education and graduate studies in the field of aerodynamics.

Take the airspeed indicator as a source of lift information. You take it, because with the Landing Speed Indicator I don't need the airspeed dial except maybe to check now and then. We are all aware of the lag in airspeed indications. With the LSI, the slightest change in longitudinal control while making an approach results in an instantaneous indication on the LSI pointer. The airspeed indicator lags considerably behind in showing the change.

Bob Jones, chief pilot for Safe Flight, demonstrated that lag condition during one of our simulated approaches out over Westchester. The LSI pointer moved out of the white portion of the arc, which is the optimum lift segment, and edged into the red portion, which shows loss of lift or stall. However, with the LSI pointer in the red, the airspeed indicator showed 100 mph—well above the stall of the Twin-Beech under conditions as they then existed. The control shaker began to buffet before the airspeed indicator hit the stall speed. Jones, with his eyes on the LSI, was in position to take corrective action while the airspeed was groping to read "stall."

We decided to let the airspeed indicator play the role of the slow-witted country cousin, which it is in comparison with the quick-reacting LSI, and test the capabilities of the new instrument. Phil Dickinson, Bill Strohmeier and Jones had briefed us and it was now time to let the Land Speed Indicator speak for itself. It did.

Covering the airspeed indicator, we rolled down the runway at full rated power and the Landing Speed Indicator pointer centered. When the correct lift for best climb was reached, the Twin-Beech took off and climbed effortlessly. The centered pointer told us that we were constantly holding the proper lift angle for optimum climb. On take-off and climb, we were using the lift capabilities of the wing far more effectively than is possible with airspeed alone.

In addition to the visual presentation of lift for normal take-offs, the LSI is invaluable for engine failure climb-outs. We simulated that condition, one of the most serious emergencies a pilot can encounter, and here's how it went. We had power on the right engine only. It was showing 2275 rpm, about 33 inches, and the left engine was idling at about 1,000 rpm. With the LSI centered and the airspeed at 108 mph, as shown in an accompanying photograph *(page 13)*, we climbed on out. We depended on the LSI, rather than airspeed, to tell us how we were doing. It did, but it was a big temptation to tear my eyes away from the LSI and concentrate on airspeed. This instrument proves that a high airspeed in an emergency condition is not always the safest or best for maximum aerodynamic performance.

I found, too, that the LSI is a work-saver. It gives you right there on the point of a needle a direct, instantaneous reading of information now obtained through mental or slide rule gymnastics, the results of which must then be interpreted in terms of airspeed indications. In other words, it eliminates the need for estimating weight and trying to figure its effect on an aircraft's take-off, approach and landing speeds, which vary according to load, acceleration, flap and power settings, and turbulence. The difficulty with that procedure is that the pilot is basing his airspeed corrections on rough calculations or arbitrary allowances.

When you keep that LSI pointer on dead center, you automatically establish a safe approach speed, regardless of load, flap configuration or condition of turbulence. The result is that there is little tendency to approach a bit on the fast side, especially under instrument conditions, and, therefore, there is no need for overshooting.

The LSI also works against any tendency to undershoot. In the approach and take-off zones, a pilot refers to airspeed not to find out how fast he is covering terrain but to get an indication of lift. If he keeps that LSI pointer centered, he knows he's got the best information obtainable on his lift. I am convinced that, if and when we make complete blind landings, the LSI will set you down at the end of the runway at the same increment above touch-down speed on *every* landing. That uniformity is something not easy to obtain with present instrumentation.

This new Safe Flight instrument is going to become a handy gadget to civilian and military pilots. In the type of equipment he flies, approaches made too fast mean excessive tire and brake wear and, not infrequently, an overshot landing. With the LSI automatically taking into consideration such factors as gross weight, flap setting and landing gear configuration, the pilot knows he's maintaining the proper approach condition.

As one dead-head on our flight put it: "No one can say to the pilot flying an LSI 'I don't like your attitude.'" The LSI controls attitudes by controlling lift.

We begin to see the importance of precise lift data when we think of jets and sweptback wings. Just how critical the proper approach speed can be can be demonstrated with an aircraft like the B-47 bomber. With that plane in a landing speed 10 to 15 mph above proper speed, the pilot needs 1700 ft. more runway. The heavy jets also can use to good advantage on take-off the accurate story of lift indicated by the LSI.

Unofficial reports on the take-off crashes of the *Comet* in Rome and Karachi attribute the accidents to excessive nose-up attitude at break-ground speed. Having experienced the *Comet's* take-off characteristics, I'd venture the opinion that both accidents might have been averted *if* the pilots had been flying the Landing Speed Indicator.

The accident involving a twin-engine transport which lost power on one engine during take-off at Memphis a few years back, might not have happened if the pilot had had the

LSI in front of him. The cause of that accident, as reported by CAB, was reduction in airspeed resulting from flying the aircraft at a steep climbing attitude after power failure of the right engine. We proved during our single-engine climb-out with the Twin-Beech that the LSI reports instantly when such an attitude is reached. It does it by moving immediately out of the white, or best lift area, of the arc and swinging into the red, which means you are dangerously close to a stall.

If you are wondering about the third color on the 75° arc of the LSI dial it's green and it is, of course, the "fast" reading. The pointer on green shows the pilot he has excessive speed on approach which will create either an excessively fast touch-down or a prolonged flare-out, resulting in a long or overshot run on landing. If you're inclined to come in a bit hot, the LSI probably will convert you to the lift coefficient school of approaches. That's the happy medium between the hot and slow pilots. I wonder if Safe Flight has thought of calling its new instrument the Liftco Indicator?

I have two criticisms to offer at this point to the Landing Speed Indicator. One is that it is still another dial for the already crowded instrument panel and it doesn't eliminate any other instrument. That comment begins to lose validity if you believe that any new instrument will win a place on the panel if it does a superior job or gives the pilot valuable information he has never had.

It seems to me, however, that there would be some merit in incorporating this new instrument with the airspeed indicator. In the combination I envision, the LSI would be given the dominant position in the center of the dial and the airspeed would be displayed on the perimeter. That would bring together in one spot two very closely related instruments and simplify the task of checking airspeed. Another possibility would be to set the LSI directly above the ILS for easy, secondary reference during an approach.

My other point has to do with the face of the LSI dial. I know Safe Flight has discarded many designs, but it seems to me that the present one still is not entirely adequate and greater simplification is necessary. I am of the opinion, too, that what is indicated on the dial could be better labeled to help the pilot in his corrections for excessive speed (green zone) and lack of speed (red zone).

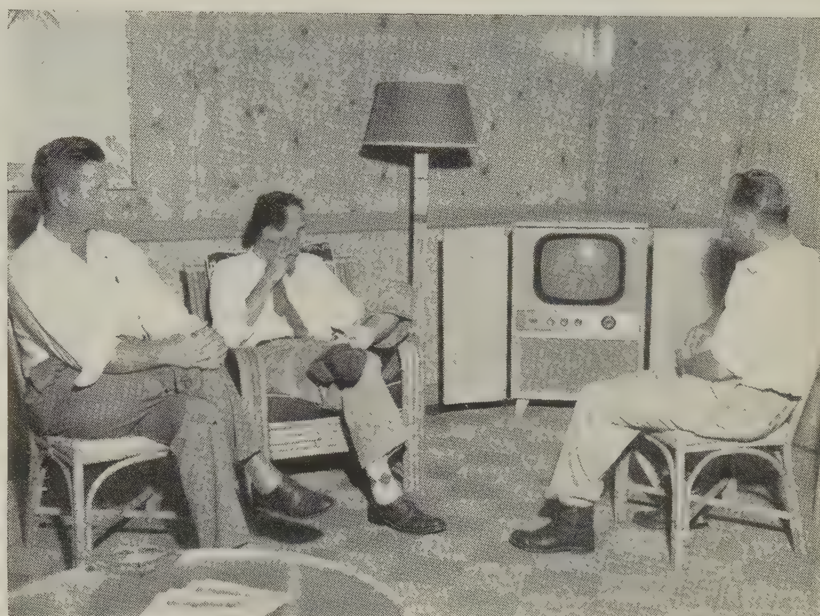
I mentioned earlier that the sensing unit of the LSI is a small transducer unit with a small vane protruding out and down from a point just below the leading edge of the wing. The transduced signal from the sensing unit at the stagnation point sends to the LSI pointer in the cockpit a very accurate indication of the wing's lift coefficient.

If you believe that the LSI is a stall-warning device with another name, it isn't. The LSI, with its transducer and sensing vane, represents a considerable departure from the stall sensing unit being manufactured by Safe Flight for its well-known stall warning indicator. In the latter, the vane closes a switch which actuates an electrical circuit operating a warning device in the cockpit when the aircraft comes too critically close to a stall.

However, in the LSI the transducer circuit contains a sealed frictionless, variable reluctance transformer which gives continual measurement of wing lift coefficients during approach and take-off ranges. The vane is electrically heated to eliminate any icing problems. It is a null-type rate instrument and its relationship to airspeed is likened to that existing between the Zero Reader and the directional gyro. The entire system weighs less than three pounds, and sells for about $500.00 installed, for aircraft with AC systems; somewhat more for those with DC systems. It operates on the aircraft's AC power supply. A motor can provide for AC conversion in the event an aircraft has only DC supply.

The Landing Speed Indicator has created a great deal of interest and discussion wherever it has been flown. The Navy is seriously considering evaluating this instrument in its operational aircraft, and Pan American World Airways is set for an evaluation. In Canada, the Department of Transport, the Royal Canadian Navy, the Royal Canadian Air Force and Canadair already have purchased the LSI. Philippine Airlines is buying LSI's for their DC-6B's.

That about winds up the story of the Landing Speed Indicator. It represents another big step forward in the continuing task of removing guesswork in flying an airplane.



Pilot's Bamboo Club

The Bamboo Club, Pacific Airmotive's luxurious pilots' lounge at Linden, New Jersey, was a year old on June 18th, and there's many a pilot who's ready, willing and able to share in the celebration. Since the lounge was opened, more than 300 membership cards and keys to the club have been forwarded to the Chief Pilots and crews that regularly visit PAC-Linden. Most of the Bamboo Club's members are pilots of business aircraft whose home bases are located throughout the United States, Canada and Mexico.

Designed primarily for the executive pilot, the Bamboo Club affords a place to relax while waiting for the airplane to undergo repairs. Walls of the lounge are of knotty pine paneling and furniture constructed of bamboo adds to the attractiveness of the club. A television and radio set is available, as is an ample supply of reading material. Also, while relaxing in the lounge, a pilot can get a cool refreshing drink from the club's refrigerator. To further insure the visiting pilot's comfort during the summer months, the club has been fully air conditioned. A pilot may also obtain weather reports by tuning the high-frequency radio to 162.6 megacycles.

When visitors arrive at the Bamboo Club for the first time, their pictures are taken; and when these photos have been developed, printed and framed, they are hung on the walls of the lounge. Pilots also sign the large roster that hangs on the wall just inside the entrance hall.

Remember that the "Welcome" sign is out at Pacific Airmotive, Linden, N.J., and the next time business brings you into the New York area, a stop at the Bamboo Club will prove PAC's interest in the pilot as well as the plane.

Vickers Viscount

(Continued from page 11)

ing is essential, particularly with regard to winds aloft, and a speeding up of ground communications (particularly in Europe where difficulties of national custom and speech exist) will have to be made. Because the effect of temperature on engine efficiency and consumption is so vitally important, weather forecasts and aircraft instrumentation must be first class, and adequate ground temperature reports must be available to the pilot prior to his approach so that accurate fuel "trimming" may be made during the approach period to take care of a balked landing. Turboprop fuel consumptions are not, of course, as sensitive to height as are pure jet aircraft, so there is less to worry about in the matter of the approach, or holding or stacking, or final landing. Nevertheless, early advice of diversion is highly desirable, and the aim must be to maintain the most efficient altitude for as long as possible, and to make the final let-down in cruising configuration with zero thrust and at the highest convenient and most comfortable rate of descent. Flaps can be (and are) used to reduce speed under turbulent conditions. In the case of the *Viscount* the good handling characteristics make the final approach and landing an easy matter. The aircraft now in Canada is fitted with Dunlop "Maxerat" non-skid brakes, and the handling on icy runways is most remarkable, adding greatly to the safety of the aircraft.

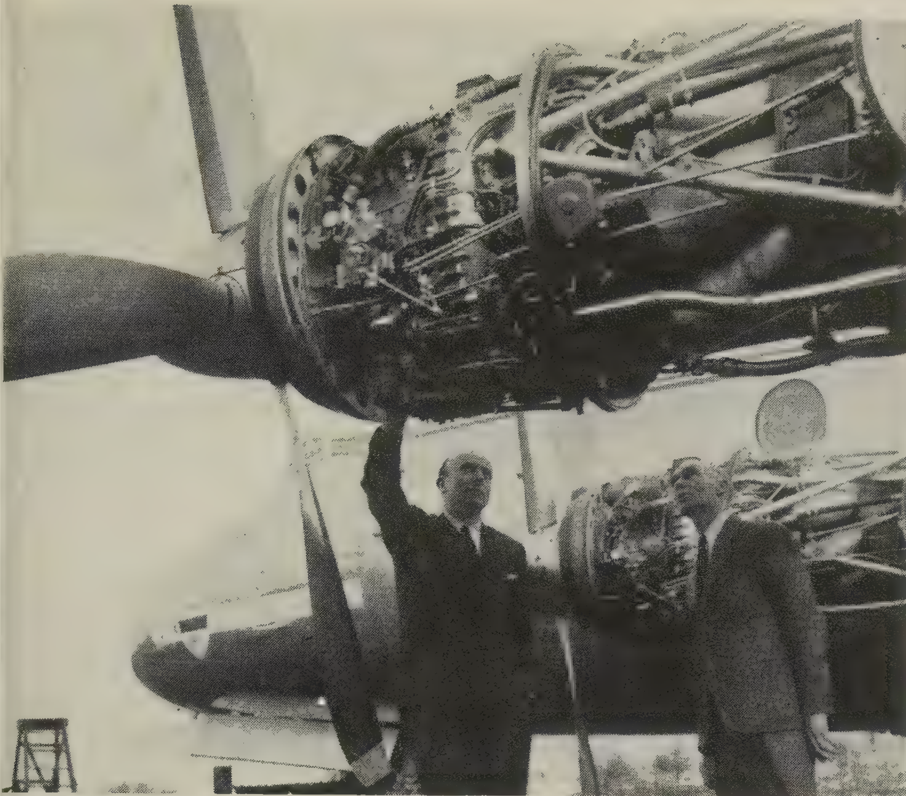
Another anticipated snag was that of adequate and efficient engine and propeller control. Obviously, as experience on the *Viscount* is gained, so will engine operations improve, but contrary to what is often stated in the United States, it has not been found necessary, or advisable, to go to complicated electronic controls for this engine-propeller combination, and a perfectly straight-forward mechanical linkage has been devised and has proved most satisfactory. The drawing board approach has proved more practical than the black box.

On the *Dart-Dakotas* the engines were run in accordance with a data plate which set out the correct rpm and jet pipe temperature for flight conditions at a given altitude at ICAN/OAT. A further correction was then made to the JPT to take care of the ambient air temperature, and the fuel flow then controlled by the fuel trimmers which, although adjusted for automatic operation at theoretical ICAN temperatures and altitudes, can be and are operated manually as and when necessary. To take care of pitch change the four constant-speed Rotol propellers are inter-connected with the throttles, and there is no further manual control except for the master feathering switches. Nevertheless, automatic feathering comes into action whenever the power drops below a predetermined minimum, provided always that the other controls are set in the power configuration. On landing, the props are allowed to "disc" by means of a switch on the undercarriage leg which, as the legs are compressed, withdraws the normal-running fine pitch stop. This "discing" is a very efficient means of braking and, with the Maxerat brakes, gives a short landing run.

At this point, it may not be out of place to give a short description of the aircraft and its engines. Bascially, the *Viscount* has no eccentricities of construction. No undue maintenance problems are posed by the main structure, which is of stressed-skin and light alloy main components, liberally provided with access doors. The fuselage is built up of open frames and outside stringers to which the skin panels are attached; the cantilever main planes have single spars with extruded booms and plate webs, carrying chordwise members, mostly of "top-hat" section. Leading and trailing edge members are of lighter construction. The flexible fuel tanks are housed in sheet-metal bays within the wings. Each wing is in two portions, the inner portion carrying the engine nacelles and main landing units. Internally balanced ailerons and double-slotted flaps are incorporated. A single fin and rudder, and upswept tail planes and elevators comprise the tail unit. The undercarriage units are hydraulically retracted into wing nacelles and fuselage nose-bay, and their single oleo-pneumatic shock-absorbers carry twin wheels in each case. The nose-wheel is steered hydraulically. Dual duplicated hydraulical braking is provided, with both hand and foot control. Main control runs are of rigid rods in roller guides; trim tab runs are of tie-rod and cable. All controls are locked on the ground from a single lever in the cockpit interconnected with a throttle restrictor bar. The flaps are electrically operated through a gear box in the fuselage and thence through torque tubes out to chain-and-sprocket mechanisms in the wings.

Except for the tail portion and the nose-wheel bay, the entire fuselage is pressurized and air-conditioned, the same system also supplying temperature control through a system of intercoolers, cold-air unit and choke valves governing the air flow. Three engine-driven blowers provide an air supply of about 66 lbs. per minute at 25,000 ft. on the standard aircraft. The system is designed to give a pressure differential of 6½ psi. Two blowers only will be fitted for TCA and, to cater to winter conditions on some of their routes, Trans-Canada's *Viscounts* will have a Janitrol type S.200 combustion heater installed. Main plane and tail unit de-icing is of the thermal type, using exhaust-heated air ducted along the leading edges, NESA glass will be used for the windshield panels on TCA *Viscounts*, where emergency fluid de-icing is also installed. De-icing for the engine air intake and propellers is electrical. A small pneumatic system supplies compressed air from a storage cylinder to the cabin and freight door seals which are inflatable.

The 1,720 imperial gallons (2,065 U.S. gals) of kerosene fuel are carried in flexible bag-type tanks, wholly in the wings. Water-methanol for boosted take-off in the tropics or when operating from high-altitude air-fields, is also carried. The electrical installa-



CHIEF DESIGNER *George Edwards (left) discusses installation of Viscount's* Dart *turbine engine with Mr. Boon, assistant chief inspector in Vickers production shop*

tion is supplied by four engine-driven d.c. generators, and the 28-volt system has overvoltage, undervoltage and overload protection. A differential relay is used to isolate the batteries from the generator. Four 208-volt, three-phase a.c. engine-driven alternators provide power for the powerplant de-icing, and dual 115-volt, three-phase a.c. inverters are used for instrument supplies.

Each of the Rolls-Royce *Dart* 505 turboprop engines develops 1400 shp at 14,500 rpm, plus 365 lbs. thrust. The mass airflow at this engine speed is 20 lbs./sec. The two-stage, axial-flow turbine drives, through direct coupling, a single-entry, two-stage centrifugal compressor having a compression ratio of 5.5 to 1. The propeller is driven through a compound reduction gear train. There are seven interconnected, straight-flow combustion chambers. The self-contained lubrication system is integral with the engine and the average oil consumption is negligible, being only about 1/8 pint per hour. The dry weight of the engine is approximately 1,060 lbs., and a maximum diameter of 38½ inches permits an exceptionally low-drag nacelle.

As far as economics are concerned the *Viscount* 700 series at its all-up weight of 58,500 lbs. can carry a payload of 13,600 lbs. up to a range of 830 miles, allowing for a 230-mile diversion, 45 minutes stacking at 5,000 ft. and 10 lbs. of catering per passenger. With a payload of 10,000 lbs. the range would be 1,340 miles. Additional tankage can, of course, be fitted in the wings. The operational versatility of this aircraft is such that the costs per ton/mile and passenger/mile are substantially constant for stages extending over the major portion of its range, and work out much below those of comparable piston-engined airliners on the basis of cost per ton/mile. While it is difficult to assess running costs without detail knowledge of an individual airline's operating methods, at present U.S. fuel and labor costs an all-in estimate of 7.66 cents per ton/mile and one cent per passenger/mile direct cost may be quoted, assuming 3,000 hours annual utilization and a 10-year aircraft life.

In assessing the values of any four-engined turboprop commercial aircraft, the following must always be considered:

1. Passenger appeal because of the quietness and freedom from vibration of the engines;
2. Low maintenance costs of the airframe with, of course, a continually improving cost curve for engine overhauls;
3. Lower cost of kerosene fuel;
4. Safety in regard to fire hazards;
5. High speed at above-weather altitudes, combined with excellent handling qualities;
6. Four-engined safety.

In the case of the *Viscount*, special attention also has been given to the emergency evacuation problem, and besides having two large doors, each window is itself an emergency exit. Ground and turn-around maintenance of both engines and auxiliary services has been designed to give the best possible facilities to the ground crews. It is generally conceded that, in order to produce a really efficient commercial transport, two steps are essential. The first is to design the aircraft around the powerplants right from the start (this is particularly the case wtih turbine engines) and, secondly, that the very greatest

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Vickers Viscount

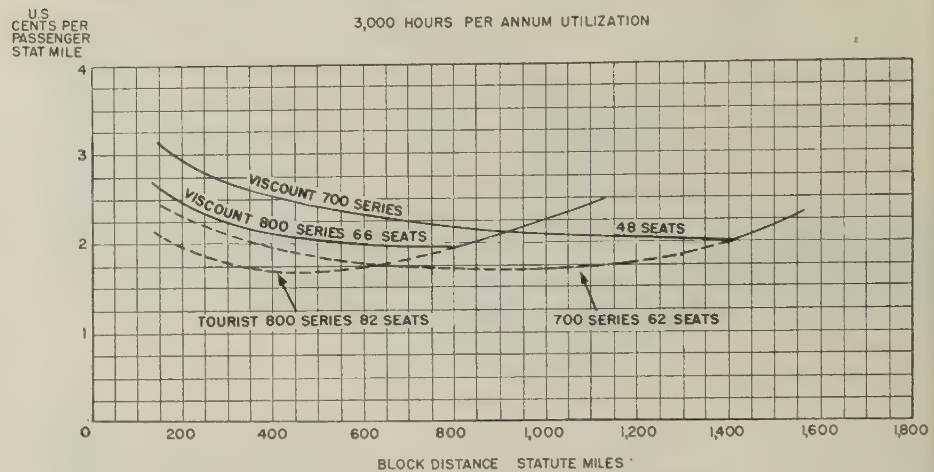
(Continued from page 51)

attention be paid to the operators' requirements. He must be consulted continually during the development of the type. These two demands were certainly observed during the design and production of the *Viscount*, and it is due to this foresight that some 70 aircraft have already been sold to operators all over the world.

Assuming, therefore (and with justification) that the *Viscount* has established itself as one of the most modern and successful transports, a glimpse at its future is interesting. The basic design of the 700 series was such that—as is the case with nearly all successful aircraft—it embodied plenty of stretch. In fact, during the development period of this engine-airframe combination alone, the all-up weight has increased from 50,000 lbs. to 56,000 lbs. Now it is up to 58,500 lbs. All of which represents a fat bonus to the operator. Realizing the value of high-density seating, however, yet a further development has been planned. This is the *Viscount* 800, an aircraft which makes use of many of the component parts of the 700, but which has a longer fuselage and engines of increased horsepower, and which is designed to carry between 66 and 80 passengers. The all-up weight of this model will be 61,000 lbs. and it has already been ordered in quantity by British European Airways as a short-range aircraft for their continental routes. Combined with these two complimentary types is a third possibility, a long-range aircraft using the larger engines but the smaller fuselage with the additional permissible all-up weight going towards the fuel carried rather than passengers.

All in all, therefore, and backed by a big production program (the output by 1954 will be eight aircraft a month), it is reasonable to suppose that the Vickers *Viscount* will, in one form or another, become as familiar to the air traveler as have the DC-3 and *Constellation*.

DIRECT OPERATING COST COMPARISON OF 700 and 800 SERIES VISCOUNTS



Viscount Specifications

	800 Series	700 Series
Normal role of aircraft:	Commercial Transport	Commercial Transport
No. of passenger seats (Normal):	66	48
No. of Seats (Max.):	82	62
Crew members:	2 or 3 plus 1 to 3 stewards	2 or 3 plus 1 or 2 stewards
ENGINES:		
Number:	Four	Four
Full designation and power rating:	Rolls-Royce Dart RDa. 5 1,540 bhp+400 lbs. thrust	Rolls-Royce Dart RDa. 3 1,400 bhp+365 lbs. thrust
DIMENSIONS:		
Wing span:	93 ft. 8½ in.	93 ft. 8½ in.
Over-all length:	94 ft. 6 in.	81 ft. 2 in.
Over-all height:	26 ft. 9 in.	26 ft. 9 in.
Gross wing area:	963 sq. ft.	963 sq. ft.
Over-all accommodation length, internal:	66 ft.	53 ft.
Internal cabin width at height of arm rests:	9 ft. 8 in.	9 ft. 8 in.
Cabin height, internal:	6 ft. 5 in.	6 ft. 5 in.
Accommodational cabin volume:	3,132 cu. ft.	2,474 cu. ft.
Undercarriage track:	23 ft. 10 in.	23 ft. 10 in.
WEIGHTS:	3 crew and 3 stewards	2 crew and 2 stewards
Normal gross A.U.W.:	65,000 lbs.	58,500 lbs.
Wing loading at normal gross A.U.W.:	67.5 lb. psf	60.75 lb. psf
Power loading at normal gross A.U.W.:	9.6 lb. equiv. hp	9.5 lb. equiv. hp
Max. disposable load, at normal gross A.U.W.:	25,888 lbs.	25,425 lbs.
Max. payload and catering allowance:	16,820 lbs.	13,989 lbs.
Max. landing weight:	61,000 lbs.	52,000 lbs.
PERFORMANCE (ICAN)		
Max. cont. cruise mean weight at opt. alt:	312 mph @ 20,000 ft. @ 60,000 lbs.	320 mph @ 22,500 ft. @ 53,000 lbs.
Recommended econ. cruise speed:	290 mph @ 16,000 ft. @ 60,000 lbs.	300 mph @ 20,000 ft. @ 53,000 lbs.
Fuel consumption @ econ. cruise:	330 Imp. gal. per hr. @ 290 mph @ 16,000 ft. @ 60,000 lbs.	282 Imp. gal. per hr. @ 300 mph @ 20,000 ft. @ 53,000 lbs.
Time to Altitude:	35 minutes to 16,000 ft. @ 65,000 lbs.	38 minutes to 20,000 ft. @ 58,500 lbs.
Distance to Altitude:	130 statute miles to 16,000 ft. @ 65,000 lbs.	132 statute miles to 20,000 ft. @ 58,500 lbs.
	65,000 lb.	58,500 lb.
Rate of Climb on Max. Continuous Power at sea level:	1,120 fpm	1,275 fpm
Rate of climb on Max. Continuous Power with one engine inoperative at 5,000 ft.:	400 fpm	550 fpm
Absolute ceiling:	27,000 ft. @ 56,000 lbs.	30,300 ft. @ 50,000 lbs.
Service ceiling (R of C=100 fpm):	25,600 ft. @ 56,000 lbs.	28,700 ft. @ 50,000 lbs.
Normal Take-off distance: s.l. to 50 ft.:	1,830 yds. @ 65,000 lbs.	1,600 yds. @ 58,500 lbs.
30-mph wind:	1,140 yds. @ 65,000 lbs.	1,000 yds. @ 58,500 lbs.
Landing distance: From 50 ft.	1,120 yds. @ 61,000 lbs.	890 yds. at 52,000 lbs.
Stalling speed at Max. landing weight:	106 mph @ 61,000 lbs. weight, (Flaps 47°)	97.5 mph @ 52,000 lbs. weight, (Flaps 47°)

RANGE AND PAYLOAD

Allowing for 45 minutes stand-off at 5,000 ft. and 230 statute miles diversion.

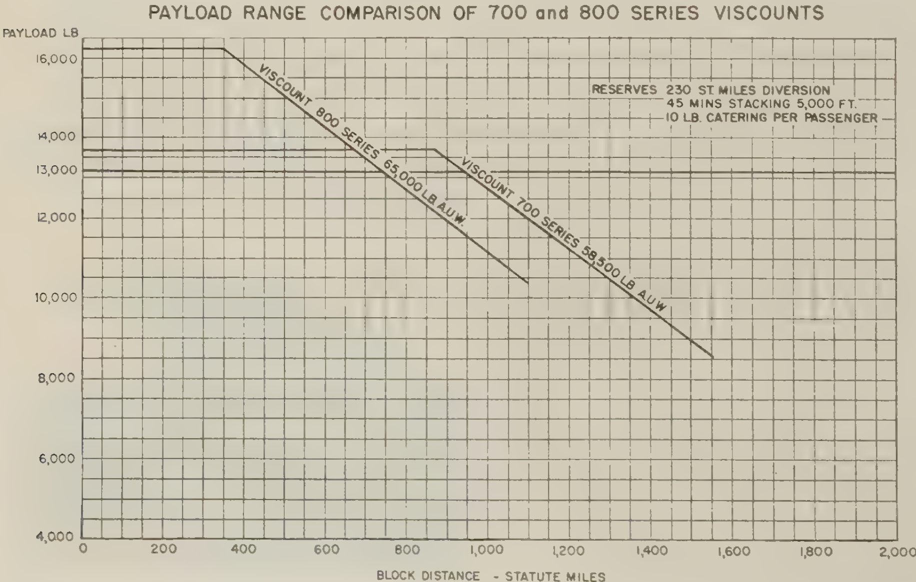
Viscount 800 series

350 statute miles with 16,100-lb. payload
700 statute miles with 13,400-lb. payload
1100 statute miles with 10,300-lb. payload

Viscount 700 series

350 statute miles with 13,600-lb. payload
700 statute miles with 13,600-lb. payload
1100 statute miles with 11,900-lb. payload
1550 statute miles with 8,400-lb. payload

PAYLOAD RANGE COMPARISON OF 700 and 800 SERIES VISCOUNTS



Thunderstorms

(Continued from page 15)

The worst place to fly through a thunder-orm is in the vicinity of the freezing level. the summertime this level over the United ates usually ranges between 12,000 and ,000 feet. Here turbulence is more frequent id the more severe types of it are encoun-red more often.

Lightning strikes are more prevalent in the cinity of the freezing level. The pattern r a lightning strike or a static discharge is irly stereotyped—the outside air tempera-ire is within a few degrees of freezing. The rcraft is flying in some form of frozen pre-pitation frequently mixed with rain. Static creases on the radio and coronae are often served around prop or wing tips. These henomena are symptoms of the buildup po-ntial in the aircraft which, when it reaches high enough value, is discharged and the story o fanother lightning strike on air-aft has been written. Usually such strikes e no more harmful than a few pin holes the metal skin or a smal lburn in the bric of the elevators but, to say the least, ey are uncomfortable, and the possibility pilots' being temporarily blinded by the ghtning flash or deafened by the static dis-harge in the receive is certainly present. o avoid such discharges the pilot, when en-untering these symptoms, should descend the point where precipitation is occurring ly in a liquid form.

Whether air-mass thunderstorms, which are ually well scattered and isolated, form a eterrent to flights is mostly a matter of the dividual pilots' equipment, skill, and ex-erience in instrument flying. As every ex-erienced pilot knows, however, there are me thunderstorms worse than others. peaking only of the type that are not as-ciated with fronts or line squalls, the verity of the turbulence encountered is easured in large part by how unstable the ir mass is. Obviously, if you lift a parcel of ir and it is much warmer than the surround-ng air, it is lighter and tends to rise very pidly, just as a cork would when released nder water. Where we have a comparatively able situation in that the rising air is not uch warmer than its surroundings, the rbulence within thunderstorms is not great nd the ease is analogous to that of a log hich has been stuck in the mud at the bot-m of a swamp long enough to become retty well water logged. Upon being dis-rbed, the log (we will assume it's a little ss dense than water) will rise slowly, caus-g scarcely a ripple as it reaches the surface. the former case the analogy is with a orm accompanied by severe turbulence and the latter, mild turbulence.

How can the pilot tell the stability of the ir mass? His only recourse is to consult with e nearest available meteorologist. In our wn work with the airline we have developed measure of this instability which we find ry useful and which has been adapted by me meteorologists throughout the country.

(Continued on page 54)

Thunderstorms

(Continued from page 53)

Soon, however, the U. S. Weather Bureau expects to send out, attached to each radio sounding, a figure which is called the Showalter Instability Index. This value is comparable to our own measure. Most forecast stations will draw charts of these values and, by looking at these charts, the pilot can easily determine which areas have a high degree of stability and which do not.

When thunderstorms occur along cold fronts or line squalls, a very different and more violent reaction is set up. A line squall may be of two types. One occurs when several thunderstorms within an air mass not associated with a cold front become lined up in approximately a straight line, either by coincidence or by some peculiarity of terrain and heating. These line squalls do not necessarily move with the wind and, in fact, usually move somewhat across the general current. They are characterized by restricted length, of the order of 50 to 300 miles, but they may be quite as severe as any other type of thunderstorm anywhere.

The second type of line squall thunderstorm occurs in a line parallel to a cold front but a hundred or so miles in advance of it. When such a structure is present, normally all of the turbulence involved is concentrated in the line squall and little or none is in the cold front proper. Line squalls of this type may extend for as much as 1,000 miles in length and circumnavigating them is usually impracticable.

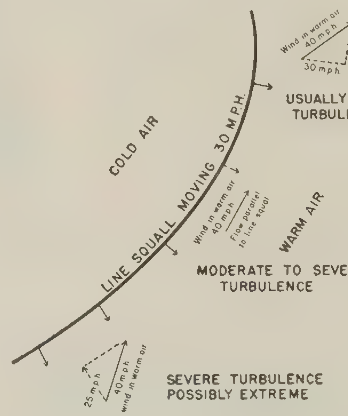
The mechanism which maintains the line squall is probably contained in the down-rush of cold air in advance of the thunderstorm. Where this down-rush takes place, spreading out in advance of a line of such storms, it causes enough lifting to create another series of cells in advance of the squall line. By this mechanism these squall lines may, and usually do, move quite rapidly. Sixty miles per hour is not an unusual speed for squall lines to travel and they may be much in excess of any winds observed anywhere around.

In 1946, Richard Whiting of Eastern Air Lines Weather Department, developed a method for forecasting the turbulence possibilities in cold fronts and line squalls which has been widely recognized and has proven to be an excellent gauge for these very severe storms.

If a pilot in flight unexpectedly encounters a line of thunderstorms, he may be almost certain that turbulence is going to be severe within them, for mild line squalls are a rarity. If, in addition, he has information that the line is moving faster than 30 mph, he may be sure that they are rough.

In our practice we use Whiting's criteria to determine whether line squalls are going to be moderate, severe, or extreme, and whether cold fronts will be mild, moderate, severe, or extreme. Unfortunately, these methods cannot always be applied, for a line squall forms with amazing suddenness or a front which has been quiescent may fire up in a hurry. Nevertheless, many times forecasts of turbulence have enabled us to avoid sending a planeload of passengers through a severe line squall.

This method can be applied in a rough fashion by any working pilot having a weather map at hand. It depends upon the relative speed with which the cold air back of the front or line squall is meeting the warm air in advance of it. The speed of the cold air may be taken as the speed with which the front or line squall has moved in the past few hours. The wind at about 3,000 feet in advance of the front is plotted as a vector in its proper orientation and resolved into its components parallel to the front and normal to it. Obviously, the normal vector represents the relative rate of approach or departure of the warm air from the stationary position of the cold front. If you add the speed of the front's movement to this vector, taking the positive sign of the warm air wind as a wind with a component directed toward the front, then you get a measure of what Whiting calls the impact between the two air masses. In the accompanying sketch three positions are



indicated. In the top one, the warm air is actually moving eastward at the same rate as the front and little or no turbulence would be expected. In the middle case, the wind is blowing parallel to the front and the impact of the two air masses is represented entirely by the speed of movement of the front. Here you would ordinarily encounter turbulence. In the lower portion of the sketch, however, the warm air is rushing to meet the front and it is this type of thing which is associated with extreme turbulence.

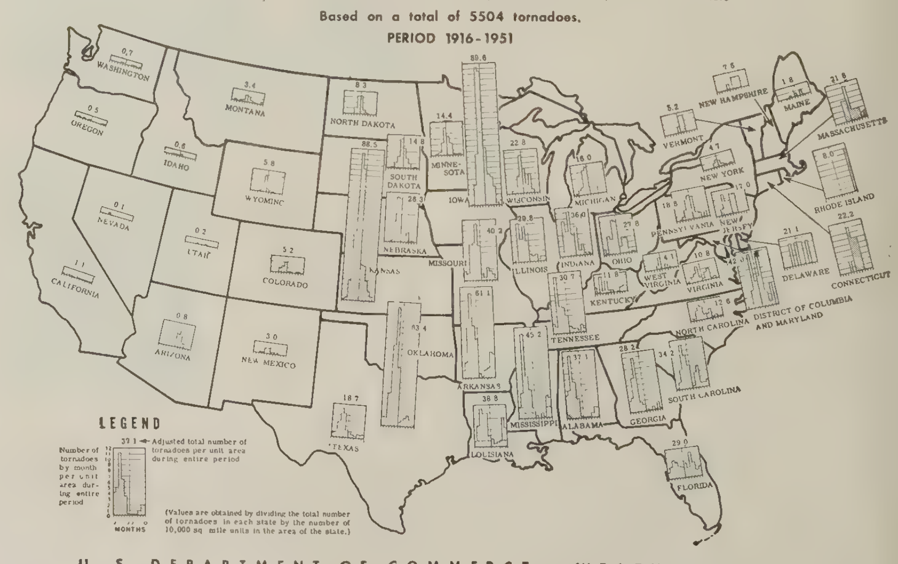
There is no reason why a pilot cannot gauge these effects to some extent from an inspection of upper winds and a weather map, especially if he also has available an instability chart such as we have already mentioned. The combination of the impact of the two air masses and the relative instability of the warm air is all he needs to make an estimate of how rough his proposed trip is likely to be.

The course pursued by most airlines in planning flights through known line-squall areas is either to plan to be on the ground when they pass or, if possible, to route the aircraft on an alternate airway which avoids the entire area. Anyone who has ever encountered line-squall turbulence will agree that this course has much to recommend it for all types of flying.

Tornadoes are a weather phenomenon not likely to be encountered by most pilots. Certainly it is not a formation a pilot is likely to encounter twice. Both the Air Force and the Weather Bureau are encouraging programs for forecasting the possibility of formation of these violent storms and pilots can obtain the Weather Bureau forecasts simply by calling the nearest office. The reason of maximum frequency of these storms starts in the early spring along the Gulf coast and moves northward with the sun. The distribution is portrayed in the map shown here which was prepared by the U. S. Weather Bureau.

It is true that severe turbulence may sometimes be encountered in perfectly clear air but for the most part these encounters are at very high altitudes and anything short of a jet aircraft is not likely to be bothered.

MONTHLY VARIATION IN TORNADO FREQUENCY
AND NUMBER OF TORNADOES PER UNIT AREA OF 10,000 SQUARE MILES, ON A STATE BASIS
Based on a total of 5504 tornadoes.
PERIOD 1916-1951



U. S. DEPARTMENT OF COMMERCE - WEATHER BUREAU

ıch encounters usually occur in the vicinity the so-called jet stream, which is a curint of air moving extremely fast (from 100 250 knots) which has its core at altitudes om 35,000 to 40,000 feet. The turbulence is ually found where the wind shear is greatt, that is, where the wind is increasing or creasing rapidly either horizontally or rtically.

All pilots are anxious to give their passenrs a smooth ride. Therefore, attention to ather maps and charts, and application of hiting's criteria can go a long way toward suring passengers a good trip.

Pity the Poor Airline Pilot

Gravity—even Einstein cannot explain it, t the airline pilot spends his life outwitng it.

The CAA officials tell him what to do, t all they know they found out from him.

While other men try to rise in their own lds, the airline pilot is most concerned out how to get down.

If something happens to the weather or e machinery or the navigation aids and he ts a hill, he was flying too low.

If he is alive, there was a mechanical faile. If he is dead, it was his fault.

If he follows the prolix and contradictory gulations, he should have used good judgent. If he uses judgment, he should have llowed the regulations.

If he keeps the stewardesses buttered up, s wife gives him hell. If he doesn't, he arves on the job.

If he flies through bad weather and gets way with it, that is what he was supposed do. If he doesn't get away with it, it was gainst the rules.

He lands on a runway covered with ice lls and snow drifts and saves the ship, and me passenger says, "What's the matter, aptain? She get away from you?"

He keeps himself well groomed, well masged, and young looking. "New with the rline, aren't you?" some passenger asks. e goes around like Will Rogers, and they quire, "You still flyin'?"

He studies the forecasts and gets surprised the weather. He doesn't study the foreusts and gets surprised by the weather.

An urchin sees him pass and breathes, Gee, there's an airline pilot." And the other rchin says, "Well, you gotta earn a livin' me way."

But the airline pilot would not trade his b for any other in the world. When he ants to think, he can turn a radio knob nd call it static. The company furnishes early everything, coffee, girls, and gasoline. ll that he has to furnish himself are the libis. When he climbs out of his cockpit, verything is over. He does not take any orries with him.

Pity the poor airline pilot. But don't overo it.

H. W. Sheridan.

Business on the Wing

(Continued from page 17)

around the country, the future of the "iron horse" was becoming assured. The speed of the locomotive and its great load-carrying capacity in the years that followed made possible the tremendous growth and prosperity of American business and industry. Great cities mushroomed along the key rail routes and railroad junctions later became thriving commercial centers.

Although the railroad brought increasing speed and greater load-carrying capacity to our transportation system, it did not provide one essential factor—true flexibility. People and merchandise could move only along fixed routes generally at fixed times.

Then just over three decades ago, a new and promising means of travel appeared on the transportation scene—the automobile. By 1920, it had emerged from the novelty stage and was proving to be a practical and serious contender for personal and public conveyance. And then a curious thing occurred.

Since the dawn of civilization, mankind throughout the world has tended to congregate in small groups which later grew to towns and eventually to cities. In America, this was a natural development because of the gregarious character of the people. As commerce expanded, communities, business and industry began to grow more rapidly. Manufacturers tended to build their factories as closely as possible to rail facilities. Workers, in turn, lived as near as they could to the factories and business concerns. Year after year the larger cities became more congested and transportation more complex and acute.

The advent of the automobile had, however, added something new to the transportation picture. Flexible movement became possible for the workers. It was no longer necessary for them to live so close to their work. Gradually there was an exodus of the more prosperous families toward the suburbs. This unprecedented growth of suburban residential areas around the nation in recent years has proved one of the outstanding economic and social phenomena of our times.

With this change in our daily living pattern there came another significant development—the moving of industries away from the large metropolitan areas to the smaller communities. Today, decentralization of business and industry is gaining momentum and causing considerable concern on part of the municipal authorities in the bigger industrial centers. The loss of the high taxes paid by these concerns as well as the pay of their employees is cutting down the heavy coffers of these cities.

Since it was no longer essential for a manufacturer to be located in a major center where adequate rail facilities and services were at hand, the move was considered economically feasible and desirable. The flexible transportation provided by the motor carriers permitted plant locations in areas that best suited the requirements of the manufacturer.

Thus land transportation had developed into two contrasting systems that greatly influenced the progress of American commerce. First, the railroad which provided speed and large hauling capacity over fixed routes to certain cities. Second, the motor carriers which provided both speed and flexibility. Each have played a major part in the advancement of business and industry and have made an incalculable impact on the national economy. Their continued vital importance to the vast commercial market cannot be underestimated or de-emphasized.

Yet, during the past 15 years, a newer and more unrestricted addition to the transportation system of our nation has brought about a most remarkable change. It is the phenomenal growth of domestic scheduled air transportation.

An intricate and expanding network of air routes has brought key cities of the nation to within minutes and hours of one another. The Air Transport Association reports that three out of every five people in the U.S. are directly served by their fleets of sleek airliners and that the largest percentage of the urban population lives within a 25-mile radius of an airline stop. Today, over 600 communities on the airways are enjoying the benefits of swift and luxurious scheduled air travel.

American enterprise has reacted to the speed and comfort of air transportation in a manner that might be expected in an economy that is solidly rooted in and dependent upon an efficient transportation system.

But, in recalling the historical contribution of the railroad and motor carrier to our business and industrial expansion, this question might be asked: Are the domestic scheduled airlines alone capable of providing the full range of flexibility and time-saving demanded by the business executive?

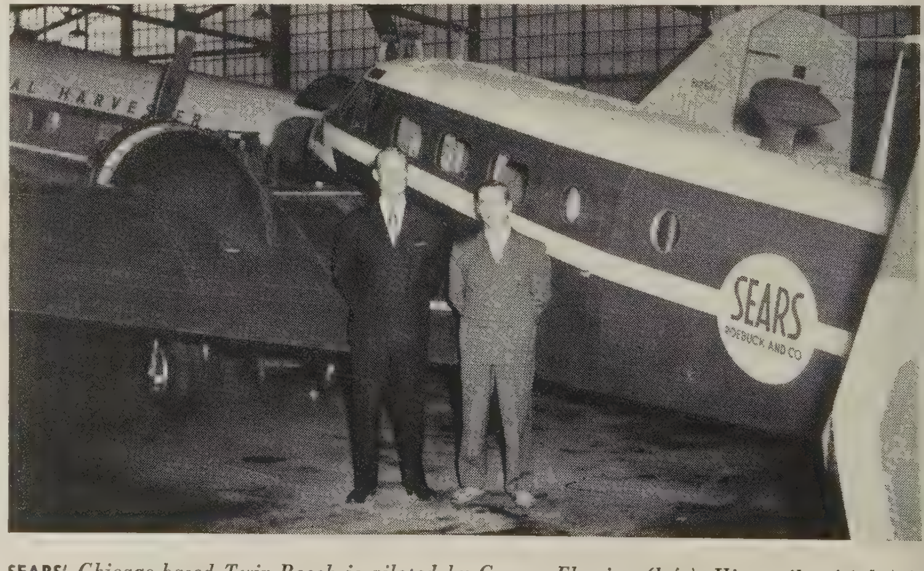
Already, in light of the remarkable growth of business-aircraft ownership and operation in the past five years, the answer is definitely negative. When the business-aircraft fleet in such a brief span of years increases from 2500 to 10,000, of which today over 1800 are of the multi-engine type, there is an obvious deficiency in the domestic scheduled airline services. And when flying hours zoom from only several hundred thousand a year back in 1946 to over three million in 1952, it is further positive proof that business aircraft are filling an important and pressing transportation need.

It is the result, as previously mentioned, of American industry moving away from the major population and industrial centers. This decentralization means that an increasing proportion of business travel is to and from smaller communities which do not have a scheduled airline stop.

The trend of industrial decentralization is striking. Prior to 1940, approximately 50% of all plants were located in cities having a population in excess of 100,000. Since that date, the figure has dropped to about one-third. It is most significant that 30% of the new plants were established in towns with populations of 10,000 or less.

As earlier pointed out, the speed and flexibility of the motor carrier initially set in motion worker and business exodus from the larger cities. If the relationship between the railroad and the motor carrier can be conveniently compared to that between the scheduled airliner and the business airplane, a revealing similarity is at once apparent. They, too, illustrate the factor of inflexible vs. flexible modes of air transportation. Simply because the scheduled airliner cannot bring its full convenience and advantages to the largest majority of American business and industry, then the natural tendency is to purchase and operate the type of aircraft that will best meet their respective requirements.

Although it is true that too little attention was centered upon the experimentation of business executives with company-owned and operated aircraft prior to World War II, its potentialities were dimly recognized. Yet the spade work was being done for its future acceptance as an essential "tool". Even in 1942, the air-miles piled up by aircraft flown for business purposes was almost one-fourth



SEARS' *Chicago-based Twin-Beech is piloted by George Fleming (left). His copilot (right) is Ed Van Sickle. Mr. Van Sickle also is in charge of maintenance on Chicago-based aircraft*

of that of the domestic scheduled airlines.

These are the published figures in 1942 and in 1952:

Type of Operation	*Air-Miles Flown*	
Domestic	1942	1952
Scheduled airlines	130,493,120	13,150,000,000
Business aircraft ..	29,667,100	520,000,000

Although the domestic scheduled airlines with higher speed aircraft flew over 25 times as many air miles in 1952 as business aircraft, the latter flew a greater number of hours.

Here are the approximate figures:

Type of Operation	*Aircraft Hours Flown*
Domestic	1952
Scheduled Airlines	2,625,000
Business Aircraft	3,250,000

The above data clearly indicates that the business airplane, as an indispensable asset in the advancement of American enterprise, is here to stay. It now has mainly become a question of how fast will its utility grow.

It is only normal to expect that business aircraft would find increasing acceptance in the "off-airline" communities. In this connection, the Rynel Corporation of Sterling, Illinois, affords a highly significant commentary to the report of ATA that the largest percentage of the urban population is located within 25 miles of scheduled airline service. Rynel is situated about 125 miles from Chicago, has once-a-day train service and no airline service at all. Although Illinois is criss-crossed by airline routes, Rynel's business requires flying its executives to points which are sometimes difficult to reach by either airline or train. The three corporation-owned airplanes, however, transport personnel directly and speedily to serve customers or acquire new ones.

Strangely enough, business aircraft are generally associated with large corporations earning gross profits in the millions each year. Too little has been said about how the small corporations utilize airplanes and what their use has contributed toward business growth and prosperity. In the case of Rynel, the organization was established in 1946 to produce fine pitch gears.

Just two years ago, Rynel purchased its first airplane—a single-engine *Navion*. Only 35 employees were on the payroll at that time. Because of its "off-airline" location, Rynel's business was primarily restricted to the Chicago area.

At the time the *Navion* was bought, Rynel had physical assets worth about $125,000. Today, that figure has climbed to well over $600,000.

Within 30 days after the *Navion* was pressed into service, Rynel's business backlog multiplied 10 times—from $30,000 to $300,000. Currently, this backlog is placed at an amazing and healthy $3,000,000. Perhaps the most surprising is the fact that only 30% of the corporation's business is defense production. In addition, the number of employees has tripled in two years.

Later a twin-engine Beechcraft was added by Rynel to further extend business operations. Recently, a twin-engine Aero *Commander* joined the other aircraft as an additional "tool" as Rynel's activities expanded. Although a sizeable financial investment is represented in the three airplanes, President Stetler B. Young, points out that their annual operating costs run only about 18 cents on the earned dollar.

Full credit for the tremendous growth and prosperity of the organization in the last few years is attributed to the use of aircraft. Corporation executives and salesmen, because of their ability to go where they wanted to when they wanted to with a minimum of delay, were able to tap the national market for their products. Rynel's entire business outlook was changed almost overnight by integrating aviation into its organization.

Young summarized the outstanding progress made by stating: "The whole key to our success is expanded communications. Our men can get to the potential customer and can bring customers back to investigate our facilities for wider and closer relationships."

Even if airline service were instituted at Sterling, Rynel would continue operating its aircraft. Its value for business promotion, its speed, flexibility and time-saving, have given the corporation a new slant on marketing their highly important technical product. This is possible since Rynel aircraft are flown by skilled pilots and are equipped with the latest and best of communication and air navigation aids, permitting practically all-weather operations.

But what of the cities that have regular airline service? Here the answer is the same. Just because an organization has aircraft based where there is an airline stop, doesn't always mean that such service is available to points where the commercial market is most profitable.

Take the case of the Gaylord Container Corporation of St. Louis, Mo., as an example. Aircraft is a necessity for the specialized business needs of this manufacturer of cartons, boxes, bags, board and paper. Although the executive offices are in St. Louis, the corporation maintains mills in the forests of Bogalusa, La., a small community with inadequate rail service situated more than 70 miles from the nearest airline stop. Labeled as a "milk run," Gaylord's aircraft make hundreds of trips during the year, saving invaluable time for officials and personnel.

The first Gaylord airplane was purchased in February 1945. It was a war-surplus Cessna UC-78, a small twin-engine type. Eleven months later a twin-engine Beechcraft replaced the Cessna. In March 1947 a B-25 (formerly an Air Force medium bomber) was added. Next, in October 1950, a DC-3 was bought as a replacement. In June 1951, two more Beechcrafts joined the others.

Two single-engine airplanes now round out the business fleet and they are employed primarily for aerial photography, forest patrol, short-haul transportation required at the Bogalusa mills, and for other assignments.

Chief Pilot L. L. Dorrance, Jr., had this to say about the utility of the Gaylord aircraft: "These planes have saved the com-

(Continued on page 58)

Business on the Wing

(Continued from page 57)

pany an inestimable amount of money in the rapid transportation of key executives, the swift locating of fires, and the rapid movement of firefighting equipment and personnel to the affected areas."

Gaylord's four twin-engine airplanes are almost exclusively used for executive and staff personnel transportation. In emergencies, they pinch-hit for rushing parts to the plant or mill.

Flying time on the corporation's fleet averages 600 hours a year per plane, or 50 hours a month. A record was chalked up for the six airplanes in September 1951 when over 330 hours were flown on business missions.

Again, Gaylord's use of aircraft to promote and develop its industrial interests effectively illustrates the importance of having flexibility and dependability of transportation without the problem of searching timetables, checking in and out, waiting for baggage, changing trains and planes, missing imported business connections, and enduring all the other inconveniences arising when traveling in the usual forms of transportation.

Next is an example of how one of the world's largest and oldest mail order houses efficiently employs its business aircraft—Sears, Roebuck & Co., Chicago, Ill. With over 1,000 factories, offices, plants, and r tail stores in the United States, Mexic Canada, Cuba and South America, the co pany has found that its multi-engine ai craft—two DC-3's and two Beechcraft D18 —are paying off in convenience, reliabilit accessibility and time-saving.

Although Chicago daily has a stea stream of airliners in and out of Midwa Airport from and to all points of the co pass, Sears is completely sold on the utili of its company-owned and operated aircra

Flying an average of 2400 hours annuall with about 700 hours utilization of the DC-3 and 500 hours on the Beechcrafts, Chief Pil J. V. Swanson figures yearly operating cos to be approximately $240,000. It is compa policy not to exceed a 50% load factor on flights. Greater use and service also is p sible by basing aircraft in three sections the country. One DC-3 and Beechcraft a based in Chicago with three pilots and c pilot/mechanics on 24-hour call. Anoth DC-3 and crew is based in Los Angeles, se ing the western territory. The southern ar is covered by a D18 and crew in Atlanta.

To balance annual operating cost, Sears quires that each Department using the a craft services be charged regular airli fares. This unique method of defraying e penses proves highly satisfactory and hel to keep the flight operation ledger in t black. Swanson recently had this to say: " any question of over-all saving, the great a vantages of time-saving and convenience f the company executives must be considere Dollar and cents can't be figured in pla ning schedules, especially the way that t method of planning allows for flight a schedule changes en route." Customarily, domestic trips are scheduled a week ahe and foreign trips are planned three wee in advance.

In the foregoing, the typical business fl ing operation of three organizations—sma medium and large—engaged in entirely d ferent commercial activities, clearly shows t tremendous value of aircraft ownershi Such cases can be multiplied hundreds times throughout the nation. In many stances, the geographical and physical loc tion of these progressive organizations e able them over a period of time to material reduce travel costs of top personnel by fre ing them from time-table restrictions a swiftly transporting them by air to and fro off-the-beaten-path localities.

Whatever the reasons for the phenomen growth and development of business flyin it is here to stay. As a unique and effecti tool which is revolutionizing long-accept commercial concepts and methods, expandi markets, introducing new sales techniqu and follow-up, streamlining over-all ope tions, and enhancing prestige, the busine airplane is having a profound effect up the national economy. It is living, dynam proof that American enterprise is quick recognize and adapt to its needs and p poses the most practical and economic ways and means of serving its national a vast world-wide markets.

Billion Dollar Race

(Continued from page 19)

Lord Douglas of Kirtleside, chairman of British European Airways. "There is much talk of what we are earning in the export of British automobiles," he says. "We can make more dollars selling one *Comet* than we can selling 1,000 motorcars—and be saving steel to boot. But more than exports are at stake. If we find the means to exploit our present technological triumph, we can capture the skyways of the world."

Creatively, the British have the edge because their plants and staffs are smaller. Where Douglas' engineering department will number 2,000, de Havilland, for example, has only 400. Their factories are more affairs of hand labor than our own. We have giant machines that can stamp out whole wing sections. They do it bit by bit, which is a disadvantage if you want quantity, but creatively it has much to recommend it. A design can be modified at comparatively small cost and far more quickly.

They are also ahead in the way the different aircraft factories cooperate. They have virtually no secrets from one another. Once a month some 60 specialists from the jet-engine companies get together with university professors and government experts for a three-day meeting, to give each other lectures and talk out problems. When de Havilland wanted to measure the vibration frequency of turbine blades in flight and did not know how to do it, Rolls Royce lent them the machine and a man to operate it.

It was in this atmosphere of free trade in industrial know-how that the *Comet* was born. Back in 1942 Winston Churchill formed a committee to make plans for postwar civil aviation. The committee talked for a year and agreed that Britain could not hope to make a piston plane good enough or in time to compete with the Americans. In the words of one of the members, they felt they had to do "something peculiar." They decided that the peculiar plane would be jet propelled. "It was a gamble," said Sir Geoffrey de Havilland. But in his lifetime this tall old man, famous for his pioneering in aviation, has seen wilder dreams come true.

De Havilland's creative staff was occupied with war jobs, the year by then being 1944, but between whiles they doodled and figured and gazed into the crystal ball. They toyed with the idea of three engines and twin booms. They put the tail in front, then in the back again. Finally they took it off altogether. Among themselves they called it the *bootstrap plane* because it was designed to lift the British air industry up by the bootstraps. Finally, they built a half-scale *Comet*, without a tail and with sharply sweptback wings. It was known as the DH-108.

A few days after it was rolled out, young Geoffrey de Havilland, the company's chief test pilot, took it into the air and put it through its paces. "A beauty," he exclaimed. It was the fastest thing he had ever flown, but it was hard to control and it landed far too fast for a civilian carrier. He kept flying it. One day he put it over the sound barrier, the first plane in England to exceed the speed of sound.

This was 1945. Sir Geoffrey, watching him, delighted in his son, a man born to wings, but he could not help feeling uneasy. He had three sons. One had been killed over that same field when the *Mosquito* he was piloting collided with another plane. He now had only two.

Four and a half months had gone by in the continuous testing of the DH-108, and jotted down in the careful handwriting of engineers were the data that had been accumulated—the answers to a great many questions. This day Geoff was planning to use the plane to attempt to establish a British speed record. He took it into the skies for a trial spin. It never flew again. In midair it disintegrated, killing the test pilot, leaving the old man with only one son.

Work did not stop, but the idea of a *Comet* with no tail was abandoned. The sharp sweepback of the wings was modified. Thanks to what the test pilot had taught the engineers, they were convinced they did not know enough about these things yet.

The Ministry of Supply agreed to buy the first two *Comets*. British Overseas Airways Corporation (BOAC), also a government organization, agreed to take 14 under certain conditions of performance and price. With these orders de Havilland's had roughly $20,000,000 to build a plane for which there was no precedent, and for which there were no other buyers in sight.

By American standards, de Havilland's is not a rich company, but it had faith. It backed this faith with at least $30,000,000 of its money and continued work. There was still a great deal to know: for example, the behavior of materials at extremely low temperatures. The engineers built a freezing chamber large enough to take the *Comet* and subjected it to temperatures of 70° below zero C. Flexible hoses and bag tanks went to pieces—and a hunt was started for materials that would tolerate the cold. Hydraulic rams tested the wings, bending them at the tips as much as three feet. The cockpit was built into a glider and flown at the end of a tow

(Continued on page 64)

Unguarded Moments

Sadie the Stewardess thinks that a universal joint is a roadhouse.

o

The Coast Guard pilots are looked up to by all other flyers. And there are no women in the Coast Guard, a strange thing for there are women even in the Marines these days. The story is that they tried one and one day she reported, "The coast is clear," and it was widely misunderstood.

Hy Sheridan

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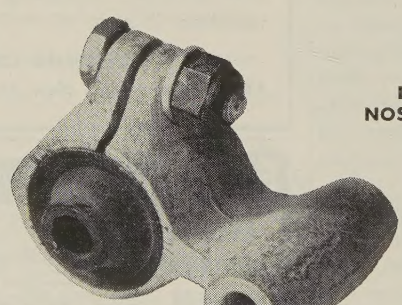

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Billion Dollar Race

(Continued from page 59)

rope to test the effect of rain on the cowling. The fuselage was submerged in a 35,000-gallon tank of water and subjected to pressures many times what it was likely to encounter.

Throughout the plant, night and day, the tests proceeded. The undercarriage suffered 10,000 retractions. The power-boost controls were given a trial of six months, the equivalent of 30 years' flying. The nose wheel was tested with a three-ton track chassis. The engine was run on the bed and in the air for 19,500 hours or about three years of day and night flying.

On the ground each engine had the sucking power of 10,000 vacuum cleaners. Once a man's hat was inhaled. On another occasion an 8-lb. cake of ice was swallowed. The engine coughed a little but apart from a slightly bent turbine blade showed no ill effect. As a result of these experiences the jets of the *Comet* were placed a good seven feet above the ground so that any danger of your losing your hat, or your life, would be negligible.

In July 1949, three years after work began in earnest, the *Comet* made its first flight. It electrified the nation. At last Britain had something which not only was ahead of the world but which roared with potentialities. To all taunts, the stock reply in England was: What about the *Comet?* A favorite cartoon was a picture of an American riding in a *Constellation* trying to thumb a ride on a *Comet.* And when a schoolgirl was asked on the radio what she would wish for if she had but 24 hours to live, she replied: "A ride in the *Comet.*" To people outside of England, the *Comet* may be just another airplane; in England it has been the greatest morale builder in a half century.

As it flies today, the *Comet* has two advantages over ordinary planes: speed and less vibration. It also burns kerosene, which is less explosive and therefore safer. A flight to Rome in this airliner is a small miracle. In a piston plane it would take five or more hours; in the *Comet* it is a little over two, a reduction in time which is truly exciting.

Contrary to reports, it is not a noiseless ride. The front part of it is fairly quiet, but as you move to the rear the noise increases until it becomes louder than in an American ship. This will be improved in later models by moving the engines farther back and by lengthening the exhaust pipe. The absence of vibration, however, is a definite virtue, because it is vibration which tires you on long plane rides. One emerges after a long trip no more fatigued than after spending the same period of time on the ground. From the operator's point of view it has economy advantages: instruments last longer, metal fatigue does not show up as quickly. It is also a simpler plane to fly. There are fewer instruments in the cockpit and new engines can replace old or doubtful ones in little more time than it takes to change a tire.

The fault most airline operators find with the *Comet* is that it is too costly. Right now it may be earning its way but only because everybody wants to ride in a jet plane and so it is making its trips fully loaded. There is, however, one fault. It has no effective braking power such as the reversing of propellers gives a piston plane, so that there is some talk of employing parachutes now being used by our high-speed jet bombers to slow them for landing.

The *Comet* burns 945 gallons of fuel an hour, which is more than twice the consumption of an ordinary four-engined plane. Let it idle 10 minutes and it will burn extra fuel equivalent to one passenger plus baggage on an average hop. The pilot is compelled to watch his tanks. He can't wait too long before landing. Over American airports this inability to hold until space at low altiude in the traffic pattern is available can be serious. Another drawback is the current lack of reliable weather information for the 40,000 feet at which the *Comet* is obliged to fly.

Most of the other shortcomings are in process of solution, and the new planes will have far more economical engines.

Among the new types being built in Britain to take advantage of such improvements are the third and probably fourth *Comet.* There is also the Handley Page crescent-winged plane capable of flying non-stop 4500 miles with 150 passengers, making the step from London to New York in seven hours. There is the Avro *Delta* or flying triangle, now a bomber, which Sir Miles Thomas, chairman of BOAC, regards as the passenger plane of the future. Of the pure jets, there is the forthcoming adaptation of the Vickers *Valiant,* a four-engined bomber of great promise.

The combination of propeller and jet, or propjet, is best seen in the *Britannia,* now on the production line. This is a far quieter plane than the *Comet,* and it flies at only 25,000 feet. Some 25 have been ordered by BOAC. They are easily capable of flying non-stop to New York with 100 passengers. Finally, there is the quietest of all, the propjet Vickers *Viscount,* more than 70 of which have been built or are in process of being built for British European Airways, Air France, and other companies. As a short-range plane it is more adequate, and in many ways it is the best of the lot. There is a possibility that Vickers will stretch it, add passenger space, to make it a competitor of the existing medium-range aircraft.

The American air industry has designed what it feels are its last airline transport planes with reciprocating engines: the latest *Super Constellation* and the DC-7. These, employing compound engines, are highly economical and fly some 50 miles faster per hour than their predecessors.

Both American and British experts agree that the piston planes still have a long life; there remain many operational problems to be solved before commercial jet transport becomes a full-fledged airline fact. The jet age has arrived. By 1963 it should be definitely here, with most problems solved and well over 80% of all passenger planes using the new form of propulsion.